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THE Journal OF THE
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JANUARY 15, 1947 • VOLUME 34 • NUMBER 2

PENICILLIN: ITS USE AND POSSIBLE ABUSE

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PENICILLIN has been called the miracle of modern medicine. But it is a lopsided miracle. It can cure lobar pneumonia but cannot touch the common cold. It can save the lives of patients with what was previously fatal septicemia but it can do nothing for colon bacillus pyelitis. It can arrest gas gangrene and syphilis but is ineffective against bacillary dysentery. In other words, penicillin, though a remarkably effective therapeutic agent against a variety of serious infections, is by no means a panacea for human ailments.

The dramatic clinical success of penicillin does not lie so much in its destructive action on a great variety of bacteria. The sulfonamides as a group are probably as effective in just as great a group of organisms. Penicillin's success results in good part from the fact that it is so innocuous. There is so little danger in its use. Whereas the use of the sulfonamides is always attended with the danger of complications as serious as the disease being treated, such as blockage and destruction of the kidney tubules, liver damage, destruction of blood cells and generalized anaphylactoid reaction, the worst toxic reactions that have been reported from the use of the more purified penicillin have been cases of severe urticarial dermatitis. Yet in this innocuousness lies the real clinical danger of penicillin. For it is so easy and safe to use that it can be employed without regard for the correct diagnosis and the proper dosage, and with a neglect of the well-established general principles of medicine, dentistry and surgery in the adjuvant management of disease.

Penicillin can be more intelligently utilized by the practitioner if he has a knowledge of the history of the development of the drug, the methods of production, the fate of administered penicillin, the blood levels necessary for therapeutic efficiency and the methods used for the determination of such levels, the nature of antibacterial action and the clinical course of the disease to be treated. It is the purpose of this paper to review some of these factors in a brief and simple way and to describe those procedures that are most frequently and generally accepted in the administration of penicillin.

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Read at the midwinter meeting of the Chicago Dental Society, February 1946.

History

Penicillin belongs to the class of compounds known as antibiotics, which can be defined as those substances elaborated by micro-organisms which have the property of destroying or inhibiting the growth of other micro-organisms. Most of the organisms that produce antibiotic substances are found in the soil, for it is in the hectic competitive economy that exists among the micro-organisms in the soil that the best defense—as with human beings—is a good offense. Antibiotic substances tend to prevent, injure or destroy life. Among those with the greatest clinical possibilities are: tyrothricin from bacillus brevis, streptomycin from streptomyces griseus, penicillin from penicillium notatum and, most recently, subtilin or bacitracin from certain strains of bacillus subtilis. Penicillin, as is generally known, was discovered by Fleming in London in 1928 when he accidentally found a contamination by a colony of penicillium on a Staphylococcus culture on an agar plate. He found that the Staphylococcus colonies surrounding the colony of the mold were destroyed, only faint traces of these colonies being visible. Although Pasteur had been acquainted with this phenomenon, it was the astuteness of Fleming that led him to discover that this mold, which was closely related to common bread mold, elaborated a definite chemical substance responsible for the lysis of the Staphylococci and that that substance was present in the liquid medium in which the penicillium colony grew. He made many transplants of the original colony, using liquid media and found that the active substance, which he had already named penicillin, was in sufficiently great concentration in the original media to be effective in killing bacteria in infected wounds. He also showed that penicillin was bacteriocidal against gram-positive and gram-negative cocci and against most gram-positive bacilli but that it did not have any effect against gram-negative bacilli. Fleming was neither a chemist nor a clinician, so he did not follow up his discovery to its logical clinical conclusion.

Early Use of Penicillin

A decade later, in 1939, it was Florey, at Oxford, who, being interested in the general subject of antibiotics and their possible clinical application and who, being stirred by the discovery in 1939, by Dubos at the Rockefeller Institute, of what is now called tyrothricin, repeated Fleming's experiments and made the first effort to extract and concentrate penicillin so that it could be used in human subjects. The first patient treated was an Oxford policeman who had a Streptococcus infection. The results were good but since the amount of penicillin available was limited and since Florey already knew that penicillin was excreted unchanged in the urine, he recovered the penicillin from the patient's urine and reinjected it. The recovered penicillin in fact had fewer impurities than the original extract from the penicillium culture. Florey's first clinical report was made in May 1941, and demonstrated the therapeutic success of this remarkable substance.

Florey came to the United States in 1941 and enlisted the aid of the government in the large-scale production of penicillin which was accomplished through the help of the Committee on Medical Research of the National Research Council, and of the Regional Research Laboratories and the large pharmaceutical firms of this country. By December 1942, the first American clinical reports had appeared, and in August 1943, Dr. Keefer, Chairman of the subcommittee of chemotherapy of the National Research Council, made his first report to physicians on the results of penicillin therapy in various diseases. But penicillin was still not ready to be released for general use. Limited hospital

use of penicillin was allowed in the summer of 1944. By this time the physicians and dentists in the armed services had determined some of the indications and contraindications for the use of penicillin and the proper dosage required. These were made public by Dr. Keefer in December 1944, by a release from the War Production Board. By March 1945, penicillin became plentiful enough to be sold through the normal channels. In the meantime the price per ampule of 100,000 units had dropped from about $20 to about 60 cents.

Production of Penicillin

The penicillium mold grows on the surface of the nutrient medium used for its culture because it needs oxygen. Until recently, all penicillin was made by the shallow surface culture method wherein the mold is grown in shallow pans or bottles. Such a method requires a great deal of space. The seeding organisms used were originally all descendent of the colony found on Fleming's agar plate. Recently, different strains of penicillium have been used. The medium becomes quite acid in two or three days, but after about seven days the pH becomes nearly neutral and the solution turns a deep yellow. It is at this stage that the concentration of penicillin is at its greatest and the solution is filtered off the surface mat of the penicillium colony. In the earlier efforts at production, the yield was only 1 to 2 units per cubic centimeter, but thanks to the improvement of the media, especially that made at the Northern Regional Research Laboratory at Peoria by the use of corn steep liquor, the yield has been increased to 70 to 100 units per cubic centimeter.

Methods of Increasing Yield

A much greater increase in yield was achieved when the vat method of submerged culture was developed. It was possible to grow the penicillium in deep vessels if oxygen was bubbled constantly upward through the media, and it was possible to prevent the surface matting of the growing mold if the vessel or vat was shaken constantly during the culture period. For such cultures the original penicillium strain of Fleming was not satisfactory; new strains were sought all over the United States. After hundreds of trials, a strain found on some spoiled cantaloupe proved the most satisfactory. With the submerged method, yields of 200 units per cubic centimeter can be obtained.

A third method is a modification of the second. To produce surfaces on which the mold can grow in the submerged culture method, sterilized wheat bran is added to the medium, shaking and oxygen bubbling being resorted to as in the ordinary vat method. The yields are slightly greater and the time required for maximal yield is greatly shortened, only two or three days being required. The difficulty with this method is the sterilization of the bran.

Penicillin is removed from the medium by acidification and extraction with an organic solvent like butyl alcohol or amyl acetate, further purified by adsorption on solid adsorbing agents, eluted by an organic solvent and taken up in water solution containing the carbonate of sodium, potassium, calcium or whatever salt of penicillin is desired to be made. The water is then evaporated *in vacuo* at low temperature in the vials which are to be the final containers.

Penicillin Unit

Florey and his co-workers arbitrarily defined a unit of penicillin as a quantity of relatively stable standard preparation of penicillin. This amount, when dissolved in 1 cc. of liquid was found to prevent the growth of a standard strain of Staphylococcus aureus-H in a zone of about 22 mm. diameter when the test solution was placed in a cylindrical cup on the surface of an agar plate (previously seeded with the Staphylococci),

and allowed to diffuse into the agar. The zone of clearing could be measured under a magnifying glass after the plate had been incubated at 37° C. for 12 to 16 hours. This is the basis for the Oxford cup method of assay as worked out by Florey and Heatley. When other dilutions of penicillin are used, smaller or larger zones of clearing are produced and their diameters can be plotted on a curve. An unknown solution tested at the same time as the standard will have a concentration in units per cubic centimeter based upon the diameter of clearing which it produces as compared with the standard. The agar cup method or any of its modifications is the basis for most assays performed in the commercial production of penicillin. The method has an error of about ±25 per cent.

Method of Assay of Penicillin

For the assay of penicillin in plasma or other biological fluids, so-called serial dilution methods have been found more convenient. In a series of test tubes each containing 0.5 cc. of a nutrient medium, 0.5 cc. penicillin standard solution (containing usually 1 unit per cubic centimeter) is added to each of the first and second tubes. Then 0.5 cc. of the mixture in the second tube is removed by a pipette and added to the third tube. Then 0.5 cc. is removed from the third tube and added to the fourth until 10 tubes have been so treated. Thus each successive tube has one-half the concentration of penicillin that is contained in the preceding tube. If, now, to each tube 1 cc. of an inoculum of a bacterium sensitive to penicillin is added, and the tubes are incubated for about 16 hours, the tubes in the first part of the series will show no growth, for the concentration of penicillin is sufficient to prevent it. Somewhere toward the last of the series, the penicillin has been so diluted that growth occurs and is easily visible. All of the remaining tubes also will then show growth. If a specimen of plasma is treated in another series of tubes in a similar manner, the same organism being used, it will contain the same concentration of penicillin as the standard if the same number of tubes are clear. For example, if the standard containing one unit per cubic centimeter, when serially diluted as above, allows 7 tubes to be clear, then the unknown plasma will contain one unit per cubic centimeter if 7 tubes are clear in its series, 0.5 unit per cubic centimeter if 6 tubes are clear, 0.25 if 5, 0.125 if 4, 0.06 if 3, 0.03 if 2, 0.015 if 1, and less than 0.015 (usually equal to 0) if no tubes are clear. Three different organisms have been used in these tests. All the work of the subcommittee on chemotherapy was done with a special strain of Streptococcus hemolyticus. Others have used a Staphylococcus aureus similar to that in the Florey cup method. More recently, a sensitive strain of bacillus subtilis has been used.

In all these methods it is essential to have on hand an accurate standard which until recently was made by comparison directly or indirectly with Florey's original standard. Now that pure sodium penicillin has been prepared, the standard has been established as 0.6 microgram of pure sodium penicillin. This means that there are 1667 units of pure sodium penicillin per milligram. Most of the ampules on the market contain around 700-1000 units per milligram. However, one product that is commercially available assays over 1400 units per milligram.

Chemical Methods for Determination

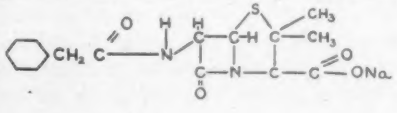
There are two chemical methods for the determination of penicillin, one of which depends upon the splitting of the penicillin molecule by penicillinase and the titration of the liberated penicillic acid with alkali. The second depends upon the reaction of penicillin to iodine. Although these chemical methods are more accurate than the biological

methods, they cannot be used in the determination of the minute amounts of penicillin present in complex biological fluids.

The sensitivity of any micro-organism can be tested by the serial dilution method in which a penicillin standard solution is serially diluted and the inoculation is made with the unknown organism. By such methods it has been found that most strains of the following organisms have a sensitivity in the order given: gonococcus, Streptococcus hemolyticus, pneumococcus, Staphylococcus aureus, meningococcus, Streptococcus viridans, Staphylococcus albus. The growth of the gonococcus can be inhibited *in vivo* by plasma concentrations of 0.03 to 0.06 unit per cubic centimeter. On the other hand, many strains of Streptococcus viridans which produce subacute bacterial endocarditis require penicillin concentrations of 0.5 unit per cubic centimeter or higher. The therapeutic implications are clear. For the ordinary run of infections by organisms sensitive to penicillin, any administrative procedure which produces plasma concentrations averaging 0.06 or more units per cubic centimeter will probably be successful. On the other hand, much higher dosages must be used for subacute bacterial endocarditis and for certain Staphylococcus infections.

Chemical and Physiologic Properties of Penicillin

The chemical composition is now believed to be known and a formula has recently been proposed not only for penicillin G, the common form, but for several other forms of penicillin which have similar but not identical actions: penicillin F, penicillin X, and penicillin K. The following formula shows the proposed structure of sodium penicillin G:



It can be seen that the compound contains carbon, hydrogen, oxygen, nitrogen and sulfur, and that there are three rings, a benzene ring, a four-membered ring containing nitrogen and a five-membered ring containing sulfur and nitrogen (i. e. a thiazole ring). The molecule also contains a peptide linkage as found in proteins, and a carboxyl group like most organic acids. Penicillin itself is an acid but is clinically utilized as a salt, the sodium salt being the most common. The ordinary ampules of sodium penicillin have a deep yellow color, but this color results from an impurity called chrysogenin. Pure sodium penicillin is white and produces colorless solutions. The same is true for the other salts. Penicillin K is rapidly destroyed in the body and is therefore therapeutically much less effective than penicillin G or X. Most commercial penicillin preparations now are made up chiefly of penicillin G.

Stability of Penicillin

Penicillin is quickly destroyed in a moderately acid solution (pH 2). It is most stable at a pH of 6 to 7. It is easily and irreversibly oxidized by hydrogen peroxide or potassium permanganate. It is destroyed by heavy metals and their salts. Therefore, solutions of penicillin should not be kept in metal containers. Penicillin is quickly destroyed by heat, especially if in solution. At room temperature, penicillin solutions are completely destroyed in four to six days. At 0° C., solutions may be kept for several weeks. In the dry ampule form, or the tablets or capsules, it is stable probably indefinitely if kept in a refrigerator and if not brought in contact with moisture. Pure crystalline penicillin is stable even at room temperatures. The danger of rapid destruction of an aqueous solution of penicillin at room temperature has been exaggerated. When penicillin is given as a continuous intravenous drip, it is now considered unnecessary and

undesirable to keep the reservoir of the penicillin solution cooled. Penicillin solutions prepared for topical application retain their potency for several days if kept in the refrigerator. Ointments of penicillin are stable if water-free. If they contain water, they will probably lose their potency in a few weeks even if kept in a refrigerator. The same is true of pastilles or lozenges.

Methods and Results of Administration

When penicillin is injected in single doses of 20,000 units intravenously, the immediate plasma concentration may be as high as 1 to 2 units per cubic centimeter but by the end of an hour the level may be only 0.03 unit per cubic centimeter and no penicillin will be present in 2 hours. With an intramuscular injection of the same quantity, plasma levels of about 0.5 to 1 unit may be achieved in the first one-half hour. The rate of fall is slower than after intravenous injection, but by two hours only 0.03 unit will be present, and there will probably be no penicillin left in the blood at three hours. Subcutaneous injections produce plasma levels somewhat lower, and the peak is delayed. Because the maximal levels achieved with subcutaneous injections are much lower than those obtained with intramuscular injections and because the former are more painful, they have been regarded as much less satisfactory than the intramuscular injections. However, we have evidence from our laboratory that subcutaneous injection of solutions of an almost pure preparation of sodium penicillin is painless and produces therapeutic levels sustained for 3 or more hours. This may mean that when purified penicillin preparations are commercially available, subcutaneous injections may replace intramuscular injections.

Continuous Intravenous Drip Method

Where high blood levels are required for a long period of time, continuous intravenous drip appears to be the preferred method of administration. Two to five hundred thousand units is dissolved in 2 liters of either physiologic saline solution or 5 per cent glucose solution and administered at a rate of 20 drops a minute over the whole 24-hour period. If a vein on the back of the hand or forearm is chosen and the rate of administration is kept constant, continued blood levels of from 0.5 to 1 unit per cubic centimeter can be maintained day after day as required. Such a method of treatment has been particularly successful in the treatment of subacute bacterial endocarditis.

Penicillin by Mouth

When penicillin is given by mouth, some or all is destroyed by contact with the hydrochloric acid of the gastric juice. That which is not destroyed is rapidly absorbed from the small intestine and appears in the blood. Whether a demonstrable plasma concentration can be achieved is dependent upon whether the rate of absorption is greater than the rate of excretion. When doses comparable with those of parenteral injections are used, so little penicillin escapes the destructive action of the gastric acid that no appreciable plasma levels can be obtained. However, when doses of 100,000 units or more are used, a sufficiently great portion of penicillin is absorbed to produce therapeutic levels in the plasma. We have found that if a priming oral dose of 200,000 units is followed in an hour by a dose of 100,000 units, the plasma levels achieved during the next two hours is on the order of 0.25 units per cubic centimeter, and that even for the next two hours there is usually from 0.03 to 0.06 unit per cubic centimeter. These findings would indicate that doses of 100,000 units every three or four hours would give therapeutic concentrations of penicillin in the blood capable of arresting most of the infections by or-

ganisms sensitive to penicillin. That has been our clinical experience, particularly in the treatment of pneumonia. The clinical results obtained with oral penicillin have been as good as those obtained with intramuscularly injected penicillin.

Penicillin for oral administration has been made commercially available in tablets of 20,000 or 25,000 units. These contain some antacid such as sodium citrate or aluminum hydroxide. These antacids diminish the destructive effect of gastric hydrochloric acid and should thus permit the achievement of higher plasma levels. At doses of 50,000 units, we have found this to be the case. On the other hand, 100,000-unit doses produced very little difference in the blood levels when various types of oral preparations, some with and some without antacids or buffers, were used.

The Romansky Formula

A new method of administration of penicillin has attained a justifiable popularity. It is the use of a suspension of powdered penicillin in a mixture of peanut oil and beeswax, first devised by Romansky. The penicillin is put up in concentrations of 300,000 units per cubic centimeter, either in 1 cc. disposable syringes or in 10 cc. ampules. In either type, the container must be heated to about 50° C. to reduce the viscosity of the mixture sufficiently to allow transferral. A single injection of 300,000 units of this Romansky formula will produce therapeutic plasma levels lasting 24 hours or longer. It has been used successfully in single daily injections in the treatment of a variety of infections. The method is particularly advantageous in office practice. The injections are more painful than those of penicillin in aqueous solution, but there are no sloughs. Care of course must be taken to avoid penetration into a vein. The one serious drawback to the method is that if a patient is sensitive to penicillin the reactions are likely to be severe, for a large pool of antigenic material will have been deposited in the tissues.

Resistance to Penicillin

As stated before, gram-negative bacilli are for the most part completely resistant to the action of penicillin. Some of these have the ability to destroy penicillin because they elaborate an enzyme capable of decomposing penicillin. Such an enzyme, called penicillinase, is produced in cultures of Esch. coli and of other colon organisms. That is why penicillin cannot be given by rectum and also why oral penicillin, to be effective, must be absorbed before it reaches the large bowel. Penicillinase is now used bacteriologically in culturing blood of patients with bacteremia who have been treated with penicillin.

Just as in the case of the sulfonamides, bacteria sensitive to penicillin can become resistant if grown in concentrations of penicillin too small to kill the bacteria. This phenomenon has been demonstrated beyond doubt in the test tube, but the evidence for it *in vivo* is not yet certain. However, most investigators believe that it can happen. It is not so much the development of a resistant strain as it is the persistence of such individual bacteria that are not destroyed by the low concentration of penicillin and the propagation of their type. The clinical implications of such development have become obvious from our knowledge of sulfonamide-resistant bacteria. A patient treated with too low a dose of penicillin or with too great an interval between doses, or for too short a time may recover from his illness but may harbor the newly resistant organism which may later reinfect him or infect another person. The infection may not respond then to penicillin. This danger is probably greatest in cases of topical treatment with penicillin and with oral penicillin. It may be present in any case where penicillin is administered without regard

to the blood levels achievable or the sensitivity of the bacteria that are being treated.

Toxicity of Penicillin

Penicillin, as has been stated before, produces remarkably few toxic effects. Chills and fever reported during the early days of this antibiotic's use were almost certainly results of the relatively large proportion of impurities in the product then available. Nowadays one seldom hears of this complication. None of the serious reactions attendant upon the use of the sulfonamides is exhibited in the administration of penicillin. There has been no blockage of renal tubules, no destruction of red cells, no agranulocytosis, no liver damage, no central or peripheral neuritis. The one complicating reaction seen in about 5 per cent of patients given penicillin intramuscularly has been urticarial dermatitis of varying severity. In some cases, this has appeared at the first or second injection and has been regarded as a reaction comparable to a positive tuberculin test. In other cases, the urticaria develops about 10 days after the injection of penicillin, especially when a new series of injections is given. This reaction is like that of serum sickness. In most cases, the skin involvement is mild and if the disease is serious the penicillin injections may be continued if another brand is tried, particularly if small test doses of the new brand are first given. In the severe cases, with generalized involvement and with severe edema, the danger of edema of the larynx and other vital organs may be so great that any type of penicillin is contraindicated at least until the dermatitis disappears and the patient can be retested. It is interesting that the experiences so far with oral penicillin have indicated a much lower incidence of allergic reactions. For example, in about 300 patients who were given oral penicillin in our studies, only one developed an urticaria that was almost certainly caused by penicillin and a second developed a mild rash which might have been caused by sulfonamide administration which had preceded that of penicillin. If oral penicillin proves less of an allergen, it may mean that the sensitization is produced not by penicillin itself but by an impurity that is not absorbed from the intestinal tract. Even the allergic reactions with parenteral penicillin therapy are likely to diminish as more nearly pure penicillin becomes commercially available.

Diseases Amenable to Penicillin Therapy

The Keefer Committee has listed the indications for penicillin therapy. These are now so well known, and can be found as package information with each ampule or with each package of oral penicillin tablets, that it is probably unnecessary to repeat them here. In general, penicillin is effective against all Staphylococci and Streptococci, aerobic or anaerobic, against gonococci, meningococci, and pneumococci. It is effective, too, though possibly not to the same degree, against gram-positive bacilli such as those which produce gas gangrene, tetany and anthrax. It is remarkably effective in the combating of infections caused by the Vincent's organism. One of the most important phases of penicillin therapy has been the successful treatment of early syphilis with penicillin and the alleviation of symptoms caused by neurosyphilis. It is now felt certain that primary and secondary syphilis, with indubitably positive darkfield tests, can be completely cured by an eight-day course of intramuscular injections of penicillin. What makes more certain the belief in the destructive action of penicillin upon the Treponema pallidum, the spirochetal organism responsible for syphilis, is that not infrequently the first dose of penicillin is attended with an aggravation of the symptoms of the disease, a phenomenon known as the Herx-

heimer reaction and believed to be caused by the liberation of killed spirochetes in the body. In tertiary syphilis and in congenital syphilis good results have been reported but there still exists some doubt whether permanent cures can always be obtained. Probably one cause for this doubt is that the dosage, the length of treatment and the number of courses have not yet been properly worked out.

Dental Applications

In the realm of dentistry and oral surgery, favorable results have been reported in the treatment of gingivostomatitis caused by Vincent's infection. Both systemic and topical use of penicillin have been successful, more rapid results being accomplished with the former. Some reports indicate the amelioration of symptoms in six to nine hours, that is, after the third or fourth injections, with complete disappearance of the spirochetes and fusiform bacilli within 48 hours. Topical application of penicillin as a spray, or as lozenges, or in cotton pledgets, or as a mouth wash or even in ice cream has been reported as beneficial and able to shorten the duration of the disease. The advantages of the topical method are the saving in the quantity of penicillin used and the possibility of self-medication. The advantage of parenteral therapy is chiefly speed of cure. A combination of the two might be the most convenient method for the dentist or oral surgeon to employ in the management of such cases.

In the treatment of alveolar and apical infections, the general opinion is that local treatment is not particularly effective. Parenteral therapy or oral penicillin has produced better results. However, here, as in any surgical infection, cures cannot be obtained unless the penicillin can reach the offending organisms. If the bacteria are lodged in débris, in dead bone or dead tooth structures or in other locations out of reach of the body fluids or of topical applications, permanent cures cannot be effected. The principles of surgical management still appear to apply, namely, that dead tissue must be removed and that abscess cavities must be drained. Where these latter procedures cannot be carried out, intensive parenteral or oral penicillin management may still be able to alleviate the disease process and to prevent the spread of the infection, if not to arrest it completely.

Dosage of Penicillin

The important therapeutic principles in the use of penicillin are the following: (1) the invading bacteria must be sensitive to penicillin; (2) the amount of penicillin given systemically must be sufficient to produce a therapeutic level for the particular micro-organism; (3) the intervals between doses must be small enough to prevent the disappearance of penicillin from the blood stream for any considerable time; and (4) the treatment must be continued for a long enough time to prevent a resurgence of the disease. Two years ago, when the Keefer report was first published and when the supply of penicillin was quite limited, the dosages recommended were naturally near the minimal level. For most acute infections, 10,000 units every 3 hours, intramuscularly, was considered adequate; 20,000 units every 3 hours was thought to be a very high dose. It is true that with such doses many dramatic cures were effected. With the greater experience with penicillin, with the diminished price and greater supply, with a better knowledge of the blood levels obtainable for the varying dosages, and with a more sober appraisal of the therapeutic results, the tendency has been towards much higher doses. The aim now is to get the acute infection under control in one or two days. In the treatment of lobar pneumonia, for example, adequate doses will produce a critical drop in temperature in 12 to 20 hours

in most of the cases treated. Many physicians no longer use 10,000 units as a dose for any treatment of an adult. They prefer 20,000 units every three hours for milder cases and from 30,000 to 50,000 units every three hours at least for the first 24 hours for the severe cases. Other things being equal, these elevated doses are in line with good therapy. But the difficulty lies in the fact that the supply of penicillin is limited and will remain limited, especially with the opening of the world market for the drug. Under such circumstances, individually good therapy may have to give way before the exigencies of public health requirements. It may be necessary to return toward the earlier dosages.

Indications for Oral Administration

In the use of oral penicillin, small doses are futile. Our experience, as well as that of other investigators, indicates that 100,000 units every three or four hours is required to give blood levels comparable with those of 20,000 to 30,000 units injected intramuscularly every three hours. It is a mistake to believe that oral penicillin should be reserved for mild cases or for the early convalescence of serious cases. It can be used for all acute infections amenable to penicillin therapy just as parenteral penicillin has been used, but the dose employed must be large enough to produce therapeutic blood levels. Otherwise it should not be used at all. It would be regrettable to bring into disrepute a remedy so remarkable as penicillin by prescribing it as a tonic. It is also poor clinical judgment to risk needlessly the sensitization of patients to penicillin and thus prevent its use on a serious occasion. Besides, as mentioned before, there is only a limited quantity of penicillin available and it should not be wasted.

Topical Application

In the topical use of penicillin, concentrations of 500 to 1000 units per cubic centimeter of liquid or per gram of ointment or pastille are adequate. If the penicillin solution comes in contact with the sensitive bacteria, it need not be present in a higher concentration than the sensitivity of the organism requires, which is seldom more than one unit per cubic centimeter. The most important feature of successful topical medication with penicillin is continuity of contact. If the required concentration can be maintained for 24 to 48 hours, the required bacteriostatic action will be procured and the infection will usually be arrested. Occasional or sporadic or momentary topical application is of insufficient value. If the required continuity is difficult to maintain, systemic penicillin therapy should be utilized.

Prophecy

As Fleming has stated, it would be strange indeed if the first antibiotic discovered should prove to be the best. Undoubtedly, there will be other antibiotics, some that may supplant penicillin, others merely to supplement it. Subtilin gives promise of having the same wide range of effectiveness that penicillin has and it may prove easier to produce. Streptomycin, if the difficulties of its commercial production can be overcome, may live up to the hopes aroused by the preliminary investigations of its effectiveness against gram-negative bacilli and possibly against the tubercle bacilli. An antibiotic may even be found that will destroy the viruses, although it is more likely that such a chemotherapeutic agent will have to be developed through other sources.

Penicillin therapy itself will probably become materially changed in the near future. Preparations of impure penicillin surely will soon be discarded, to give way to those of purified crystalline salts of penicillin. Some crystalline preparations of penicillin are already commercially available; and now that the chemical formula of penicillin is known, there

is hope that it can be synthesized. Even if such synthesis proves too difficult, there is reason to believe that derivatives of natural penicillin can be prepared which might not have the handicaps of penicillin, especially those of rapid absorption and rapid excretion. It is possible that penicillin which is an acid can be combined as a salt with another antibiotic which is a base, such as streptomycin. Such a new compound might have not only a combined therapeutic effect but might be more stable than either of its constituents.

If, from the present prolific and extensive investigations in the field of antibiotics, an innocuous substance is developed which is effective against all infections when given by mouth at intervals of eight hours, it will be "a consummation devoutly to be wished."—*629 South Wood Street.*

PENICILLIN IN ROOT CANAL THERAPY: REPORT OF FIFTY-THREE CASES

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THE dramatic results obtained with systemic use of penicillin are well recognized. Good results have been also reported with local use.[1] That the application of penicillin in root canal management has produced spectacular findings to justify its use has not been amply demonstrated. Adams[2] reported fifty-two cases that exhibited negative cultures in 75 per cent with one treatment. The method he used was to inject 3,000 to 5,000 units of penicillin per cubic centimeter into the periapical region by way of the root canal.

On the other hand, Shaw, Sprawson and May[3] obtained poor results in a series of twenty cases after subjecting their findings to a critical bacteriologic test. Their method consisted of inserting into the root canal a paper point possessing 50 units of penicillin. Grossman[4] reported a series of thirty-nine cases in which the number of treatments required to yield a negative culture with penicillin was the same as with control medicaments. His method was to employ a solution of 5,000 units per cubic centimeter, and the amount introduced was the equivalent of the volume of the root canal.

The following report is based on fifty-three cases that were subjected to critical clinical and bacteriologic tests and to a roentgenographic checkup for eight months.

Culturing Method

Two types of culture broth were used, brain-heart infusion and sodium thioglycollate. The latter was used to detect the presence of facultative anaerobes. The enzyme clarase[5] was added to both of the media to inactivate the penicillin.

1. Florey, M. E., and Florey, H. W., General and Local Administration of Penicillin. *Lancet* 1:387 (March 27) 1943.

2. Adams, Fred R., Penicillin in Pulp Canal Therapy. *D. Items of Interest* 66:1147 (December) 1944.

3. Shaw, F. E.; Sprawson, E.; and May, H. B., The Bacteriological Examination of Infected Dental Pulp Canals and Use of Penicillin in Pulp Canal Therapy. *Brit. M. J.* 1:551 (April 21) 1945.

4. Grossman, I., Evaluation of Antibiotic Agents for Root Canal Treatment. *New York J. Den.* 15:232 (June-July) 1945.

5. Lawrence, C. A., Action of Clarase upon Penicillin. *Science* 99:15 (January 7) 1944.

The original paper point that was sealed with the penicillin for one week was placed in a separate culture tube of brain-heart infusion broth. The canal was dried and fresh sterile paper points were introduced into the canal, allowed to remain for one minute and inoculated into the respective culture media. As a result, three samples were always obtained.

Each negative culture was tested further by sealing a dry paper point into the canal for an additional seven, fourteen and twenty-eight days. These points were incubated for at least seventy-two hours. Two to three negative cultures were obtained before the canals were sealed. In many cases bleeding was induced purposely in the periapical area to make sure that the tissue was critically tested.

Method of Application

The tooth was isolated under the rubber dam and disinfected with tincture of Metaphen followed by alcohol. The canal was opened and cleaned of debris as much as possible. Reamers and files of the small size were introduced to enlarge the canal. A solution of sodium penicillin, 25,000 to 50,000 units per cubic centimeter, was flooded into the canal and the reaming and filing were continued. After the pulp canal had been reamed and filed sufficiently, penicillin was flooded again into the canal, a dry paper point was introduced into the canal and with a pumping action the drug was forced into the periapical tissues. This was repeated three to five times until 1 cc. was utilized. If the area of rarefaction was large, the canal was enlarged further and a 24 gage needle was inserted and sealed with gutta-percha into the lumen of the canal so that the penicillin could be introduced under pressure. When the patient signaled that he was in pain, pressure on the plunger was released. A period of a few minutes was allowed to elapse, and the procedure was repeated until 1 cc. of penicillin had been utilized.

It must be stressed that penicillin is not to be used as an ordinary medicament, in which a small amount of drug is carried on a paper point or an amount sufficient to fill the root canal is administered. The solution must be used freely in the manner of flushing the canal, as one would use hydrogen dioxide or any other irrigating drugs.

If possible, 1 cc. of penicillin should be injected directly into the abscessed cavity through the periosteum with a 20 gage needle after drainage has been established by way of the root canal.

Clinical Data

The clinical data were obtained from a series of nonselected patients in general practice. All cases that required root canal treatment were cared for, irrespective of the size of the area and the position of the tooth. The cases were divided mainly into two groups, acute and chronic. These were subdivided diagnostically to determine in which group penicillin exemplified the best action (see the accompanying table). Of the teeth involved, eight were molars, fourteen were bicuspids and thirty-one were anterior teeth.

Case Reports

Case 1.—A woman, aged 24, presented herself in the office complaining of pain and swelling in the upper right lateral incisor.

Examination. — Examination revealed a slightly discolored tooth that was sore to percussion. The lip was slightly edematous and the mucous membrane was red, swollen and pointing one-third below the mucobuccal fold between the right central and lateral incisors. A fistula had not yet been established but the pointed area seemed ready to rupture. An x-ray examination revealed a large area of rarefaction which dipped down between the two teeth (Fig. 1, left).

Treatment.—Tincture of Metaphen solution was painted over the pointed area, and an incision was made with a scalpel. Immediately there was a foul-smelling purulent dis-

Results obtained using penicillin in root canal treatment in fifty-three cases

Type of Case	Number of Cases Treated with Penicillin	Number of Positive Cultures	
		B.H.I.B.*	Thiog.†
Acute cases:			
Acute dento-alveolar abscess with no area of rarefaction....	2	0	0
Suppurative pulpitis.....	4	0	0
Serous pulpitis..	2	1	1
Pulp exposure (caries).....	3	0	0
Subacute dento-alveolar abscess with areas of rarefaction	16	4	5
Acute dento-alveolar abscess with areas of rarefaction....	4	1	1
Total.....	31	6	7
Chronic cases:			
Chronic dento-alveolar abscess with areas of rarefaction....	11	3	3
Pulp necrosis or gangrene.....	4	2	2
Previously filled canals exhibiting apical involvement....	7	2	4
Total.....	22	7	9
Grand Total	53	13	16

*Brain-heart infusion broth
†Sodium thioglycollate

charge. After evacuation the rubber dam was placed on the tooth, and direct access was obtained into the root canal. As soon as the canal was opened, a greenish pus began to be discharged. This was absorbed with cotton and paper points until the canal was fairly dry. Broaches were used to tease out organic debris, and reamers and files were introduced immediately to enlarge the entire canal.

A 24 gage needle was introduced into the lumen of the canal and sealed tightly into place with gutta-percha. One cubic centimeter of 25,000 units of penicillin was drawn into a 2 cc. Luer-Lok syringe, and the syringe was attached to the needle in the canal. Under slow pressure the penicillin was injected into the root canal. The injection was done in stages to avoid pain, about five to ten minutes usually being required to inject 1 cc. of penicillin.

The needle and gutta-percha were removed, and a dry sterile paper point was introduced into the canal to pump the penicillin up and down in order to force the drug periapically. The paper point was sealed into the canal with sterile cotton, gutta-percha and zinc oxide-eugenol paste.

The rubber dam was removed; the area where the incision was made was painted with tincture of Metaphen, and ½ cc. of procaine hydrochloride was injected. Another cubic centimeter of 25,000 units of penicillin was introduced directly into the rarefied area intra-osseously, and was injected slowly until the entire amount was deposited.

Outcome.—The patient was dismissed and instructed to call if there was any discomfort, and otherwise to return to the office within seven days. Upon her return she stated that her original pain had disappeared entirely within eight hours and that the tooth felt very comfortable. The tooth was isolated under the rubber dam, and the paper point

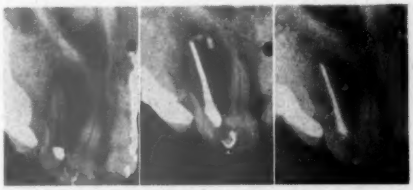

Fig. 1.—Case 1: Left: Roentgenogram taken before treatment showing area of rarefaction. Cases such as this are not amenable to root resection because of the extent and location of the rarefied area. Center: Roentgenogram taken immediately after filling of canal, one month after initial treatment. The substance in the periapical area is root canal cement. Right: Roentgenogram taken six months after initial treatment. The bone has definitely regenerated. Some of the root canal cement has been absorbed and some has dropped into the rarefied space and in time will be further absorbed

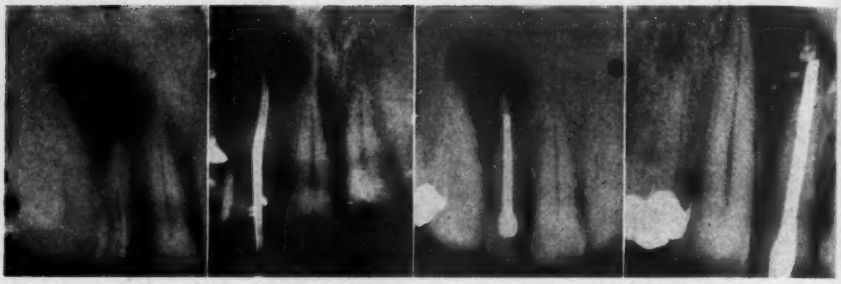

Fig. 2.—Case 2: Left: Roentgenogram taken before treatment. Note the large area of rarefaction. Left center: Position of needle before penicillin is injected. Right center: Roentgenogram taken immediately after filling of canal, one month after initial treatment. Right: Roentgenogram taken four months after initial treatment

was removed and cultured. Two paper points were inserted into the canal and after one-minute exposure were inoculated into the brain-heart infusion broth and the sodium thioglycollate, respectively. A dry paper point was sealed into the canal and allowed to remain for fourteen days. This was cultured, and another paper point was inserted for seven days. All cultures were found negative.

The canal was filled with silver cement and a silver point (Fig. 1, center). The roentgenogram taken four months later shows evidence of bone repair (Fig. 1, right).

Comment.—This case, from a clinical and roentgenographic point of view, is an excellent demonstration of the action of penicillin. Cases such as this one are not amenable to standard root canal therapy or root resection. Extraction is usually resorted to because of the location and the extent of the area of rarefaction.

Case 2.—A man, aged 43, complained of slight pain and fullness in the region of the upper right lateral incisor.

Examination.—The examination revealed a greenish dark tooth that was negative to percussion. The pulp tester gave no response, and the x-ray examination revealed a large area of rarefaction (Fig. 2, left). This patient was very desirous of retaining the tooth and did not want to submit himself to an apicoectomy. The experimental nature of this work was described to him, and he willingly submitted to treatment.

Treatment.—The rubber dam was applied, and direct access was obtained into the root canal. As soon as the canal was opened, a copious yellowish brown exudate began to flow. After this exudate had been absorbed with cotton and paper points for about twenty minutes, the canal was reamed and filed. Penicillin, 25,000 units per cubic centimeter, was flooded into the canal by means of a needle dropper (Fig. 2, left center). A paper point was then introduced into the canal and with a pumping action penicillin was forced into the apical area. This procedure was repeated three times, and the canal was then sealed.

Upon the patient's return in twenty-four hours, the point was cultured. It was noticed that the flow of the exudate was markedly reduced, and by the use of points some semblance of dryness was obtained. The canal was filed and flushed with penicillin solution. A 24 gage needle was sealed into the canal with gutta-percha, and 1 cc. of 25,000 units of penicillin was introduced under pressure. The patient was instructed to state when he felt pain. When he signified pain, the pressure was released; about two to three minutes elapsed before pressure was reapplied to the barrel of the syringe. The needle was removed, and a paper point was inserted to pump the penicillin in the canal. The point was sealed, and the patient was dismissed for seven days.

Outcome.—Upon his return, the canal was opened and the paper points were cultured, separate broth tubes being used for each paper point. The canal then could be rendered dry by the application of a half dozen paper points. A dry paper point was inserted, and the patient was dismissed with instructions to return within two weeks. Penicillin was not used this time.

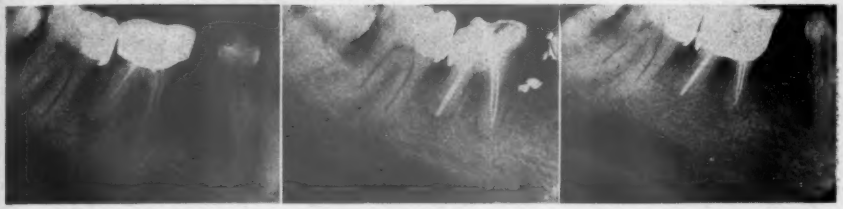

Fig. 3.—Case 3: Left: Roentgenogram taken before treatment. Note the extent of bone rarefaction and condensation. Center: Roentgenogram taken six weeks after initial treatment. Right: Roentgenogram taken three months after one treatment with penicillin. Note the complete bone regeneration, the normal outline of the periodontal membrane and the reduction in the bone condensation

All cultures were sterile and the canal was filled (Fig. 2, right).

Case 3.—A woman, aged 41, presented herself in the office complaining of pain in the lower left jaw. She stated that one of her teeth seemed to be higher than the rest and that she had not been able to close her jaws for the past two days.

Examination.—The lower left first molar was crowned and was sore to percussion, and a slight bulge existed in the mucobuccal fold. X-ray examination revealed a molar tooth with rarefied areas on both apices, with the larger area on the distal root (Fig. 3, left). The tooth was recommended for extraction. Because of certain circumstances, the patient did not want the tooth extracted at that time but she did want relief. The experimental aspect of the treatment with penicillin was explained to the patient, and she submitted herself to treatment.

A procaine block anesthesia was given, and the crown was removed and the rubber dam applied. The distal root was opened first and, as soon as the apical end was reached, pus began to move up into the canal. This pus was absorbed with paper points and the canal was flooded with penicillin, 25,000 units per cubic centimeter. Reamers and files were used to enlarge the canal and, after the filing and reaming, the canal was flooded with more penicillin and a paper point was introduced into the canal and this was pumped a half dozen times and sealed. The mesial canals were opened and enlarged, and penicillin was pumped by means of the paper points. These points were also sealed, and the patient was instructed to report immediately if the pain increased.

When the patient returned the next day, she stated that the pain had eased considerably and that she had been able to eat dinner with some amount of comfort. By next morning, all the pain had disappeared.

The tooth was isolated again under the rubber dam, and the paper points were removed and cultured. Further reaming and filing were done, and the distal canal was absolutely dry. Penicillin was pumped with paper points and sealed in all three canals.

Outcome.—The patient was dismissed for a week and, upon her return, the paper points were cultured as in the previous cases. All cultures were negative and the canals were filled (Fig. 3, center). A roentgenogram taken three months later shows excellent bone repair (Fig. 3, right).

Case 4.—A man, aged 23, presented himself in the office complaining of a slight pain in a lower right bicuspid.

Examination.—The tooth contained a large amalgam filling. There was no pain on percussion. An x-ray examination revealed a faulty amalgam filling with caries in the distal aspect of the tooth extending into the pulp with a moderate area of rarefaction (Fig. 4, left).

Treatment.—The rubber dam was applied, and the entire amalgam filling was removed. When the pulp chamber was opened, the patient experienced no pain. The pulp appeared gangrenous. Broaches, reamers and files were introduced into the canal for enlargement and to gain access to the periapical area. Penicillin, 25,000 units per cubic centimeter, was then flooded and pumped into the canal, and the patient was dismissed for one week.

Upon the subsequent visit, paper points were cultured in the double fashion, and the canals were reamed and filed. Penicillin

Fig. 4.—Case 4: Left: Roentgenogram taken before examination, showing the moderate area of rarefaction. Center: Roentgenogram taken one month after initial treatment. Right: Roentgenogram taken four months after initial treatment. Note the complete bone regeneration

(20,000 units) was introduced into the canals by pumping action and sealed.

Outcome.—The patient returned, stating that he had no pain, and, since all cultures were sterile, the canals were filled (Fig. 4, center and right).

Case 5.—Treatment.—This case was treated in a manner similar to that used in any ordinary chronic putrescent case with the exception that the canal was reamed and filed on the first visit (Fig. 5, left) and the treatment was not divided into two or three sittings as under standard procedures. Penicillin, 25,000 units per cubic centimeter, was used and pumped with paper points. One cubic centimeter of 25,000 units was injected intraosseously into the rarefied area.

Outcome.—All cultures were sterile after twenty-four hours (Fig. 5, center and right).

Case 6.—This case was a chronic dento-alveolar abscess of an upper right lateral incisor that had been previously treated.

Treatment.—The culture was continuously positive after penicillin had been administered three times in strengths of 10,000, 25,000 and 50,000 units per cubic centimeter. The positive culture was submitted to the laboratory for identification. Staphylococcus albus and Streptococcus viridans organisms were found. Penicillin treatment was repeated every two days for six treatments, and the cultures remained positive.

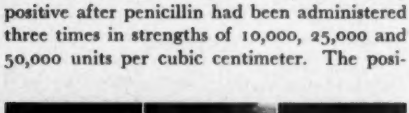

Fig. 5.—Case 5: Left: Roentgenogram taken before treatment. Center: Roentgenogram taken three weeks after initial treatment. Right: Roentgenogram taken four months after initial treatment. Note the absorption of the root canal cement and evidence of bone repair

Outcome.—Two treatments with monochlorphenol yielded a negative culture, and the canal was filled. A period of four days was used to test the paper point.

Figures 6 and 7 illustrate two cases of chronic dento-alveolar abscess, and Figures 8 and 9 show roentgenograms taken in two cases of acute dento-alveolar abscess.

Results

In fifty-three cases of all types, thirty-seven, or 70 per cent, were rendered sterile with one treatment of penicillin. Sixteen cases did not respond to penicillin therapy, irrespective of the number and concentration of treatments.

In thirty-one cases that were classified in the acute group, twenty-four, or 77.4 per cent, were sterile and seven were positive.

In twenty-two cases that were classified in the chronic group, thirteen, or 59 per cent, were sterile and nine were positive. The poorest response was in previously filled cases, four out of seven being positive. Three of these cases did not respond to standard root canal procedure including electromedication. One case responded to four treatments by electrosterilization, while in the other three cases root resection was performed. In the other chronic groups that were positive (five cases), none responded

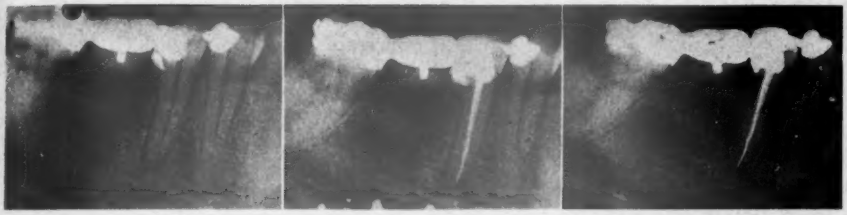

Fig. 6.—Left: Roentgenogram taken before treatment in case of chronic dento-alveolar abscess. Center: The canal was filled within two weeks after one treatment with penicillin. Right: Roentgenogram taken eight months after first treatment

after six treatments of penicillin in concentrations of 25,000, 50,000 and 100,000 units per cubic centimeter. All were rendered sterile when the standard medicaments were used.

Positive results were obtained in sixteen culture tubes having sodium thioglycollate and clarase, while only thirteen were positive in the brain-heart infusion broth and clarase.* No significance is attached to the higher number of positive cultures in sodium thioglycollate.

In no case were the canals filled unless two or three successive negative cultures were obtained. All cases were tested for sterility for a period of one to four weeks before the canals were filled. One case was tested for a period of ninety days, and it proved to be sterile after one treatment.

Cultures were allowed to incubate for seven days before they were discarded as negative.

In six cases (five acute, one chronic), there was an exacerbation of the clinical symptoms with increased pain and swelling. These six cases did not respond to penicillin therapy but did respond to the standard method.

Organisms were identified in six of the sixteen positive cultures:

Nonhemolytic streptococci and Staphylococcus albus, one case.

Hemolytic Staphylococcus albus (nonpathogenic), one case.

Streptococcus viridans, two cases.

Bacillus subtilis, one case.

Streptococcus viridans and Staphylococcus albus, one case.

Five of these were of the group that exhibited an exacerbation of the clinical symptoms.

*The first seventeen cases did not have the enzyme clarase added to the broth.

Discussion

The dramatic clinical results with one treatment of penicillin in root canal therapy are well exemplified in the foregoing cases, especially the acute periapical infections. If one should attempt to treat acute periapical infections with immediate reaming and filing of the entire root canal under standard accepted procedures, one realizes the complications that may ensue. Since these cases are experimental, a radical departure from the accepted procedures was made in order that the clinical findings could be more critically tested. In most instances pain, swelling and other clinical

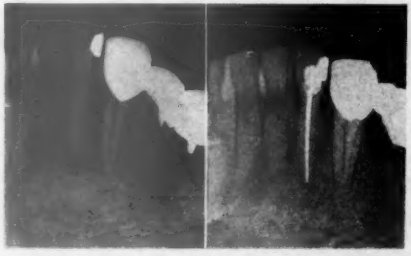

Fig. 7.—Left: Roentgenogram taken before treatment in case of chronic dento-alveolar abscess. Right: Roentgenogram taken four months after treatment. This case retained the original paper point of penicillin for ninety days, and the point was found to be sterile

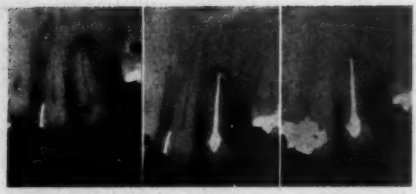

Fig. 8. — Left: Roentgenogram taken before treatment in case of subacute dento-alveolar abscess. Center: Two weeks after the initial treatment the canal was filled. Right: Roentgenogram taken eight months after initial treatment

signs disappeared within eight hours. In only six of the cases, both acute and chronic, was there an exacerbation of clinical symptoms.

The fact that there is no immediate increase of pain or discomfort after the use of penicillin suggests that the action of the drug is almost immediate. This does not mean that the drug is bactericidal but rather that the inhibition factor is immediate. Under such conditions there is little possibility of increase in the number or the virulence of the organisms. At the same time, the bacteriostatic action on the remaining organisms continues and the clinical symptoms subside. This is in keeping with the mode of action of penicillin;[6] conditions which increase the rate of growth of bacteria increase the rate at which penicillin acts. Conditions which decrease the rate of growth decrease also the rate at which penicillin acts. Penicillin is most effective when active multiplication takes place. The larger the amount of penicillin used the faster is the organism destroyed.

6. Hobby, Gladys L.; Meyer, Karl; and Chaffee, Eleanor, Observations on the Mechanism of Action of Penicillin. *Proc. Soc. Exper. Biol. & Med.* 50:281 (June) 1942.

High Concentration Necessary

The selection of the solution of 25,000 units per cubic centimeter was arbitrary. A high concentration is necessary because the volume of a root canal is about 1/5 cc. or less. It is therefore obvious that only 4,000 or 5,000 units are directly introduced into the canal with a single application.

The inhibition or bacteriostatic effect is due mainly to the concentration used and not the volume. An *in vitro* experiment demonstrates this quite clearly. If a root canal paper point is moistened with a solution of 25,000 units per cubic centimeter and placed in a blood agar petri dish containing the numerous organisms of the mouth, and then another paper point is moistened with a solution containing 1,000 units per cubic centimeter, placed in another petri dish and allowed to incubate for forty-eight hours, it will be seen that the paper point containing 25,000 units has a greater zone

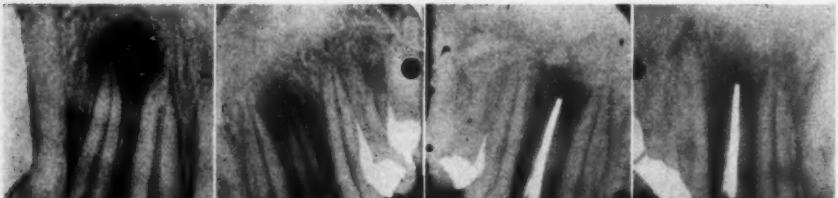

Fig. 9.—Left: Note the circumscribed area of rarefaction in a case of acute dento-alveolar abscess. Left center: Roentgenogram taken one month after initial treatment. Note the improvement and also the extensive enlargement of the root canal by reaming and filing. The filling of the canal was delayed so that bacterial specimens could be obtained over a long period of time. Right center: Roentgenogram taken four months after initial treatment. Right: Roentgenogram taken six months after the first treatment

of inhibition than the paper point with 1,000 units per cubic centimeter.

The amount used in these experiments did not produce any toxicity or irritation, even though the concentration was comparatively high.

The variance in the results of the other investigators[3, 4] may be due primarily to a difference in the concentration used. Although results have been reported with relatively small quantities of the material, this does not rule out the need of larger doses in some cases. At any rate unsatisfactory results may be ascribed in some instances to too small amounts of penicillin.[7]

Although cultures were not taken previous to the penicillin therapy to determine presence of bacteria, in most instances teeth with areas of rarefaction are recognized as infected. Certain authors[3, 8] have reported that in a few instances areas of rarefaction have yielded negative cultures. Burket[9] has shown that large areas of rarefaction yield a smaller percentage of positive cultures than small areas of rarefaction.

Influence of Method Used

The results were not influenced by the method used. It was felt that with an intra-osseous injection the operator could be more certain that the penicillin had been deposited in the periapical area. The method of administering penicillin in root canal therapy is dependent largely on conditions and on the position of the tooth. The drug may be introduced into the canal by means of a needle dropper and then pumped up and down with a paper point, it may be forced into the periapical tissue by means of a syringe, or it may be injected intra-osseously directly into the rarefied area.

The canals should be reamed and filed as wide as possible. This serves a dual purpose: (1) there is a greater and better débridement; (2) if the canal is made larger, more units of penicillin can be introduced.

Some cases were allowed to retain a dry sterile paper point for three weeks. When removed, the paper points had just a slight moisture in the apical aspect. In some cases when bleeding was induced purposely, the paper points were dry on the subsequent visit and no case exhibited weeping as is observed when strong chemicals are used.

The failures may be attributed to the presence of penicillin-resistant strains of staphylococcal and streptococcal organisms or Bacillus subtilis[10] as exemplified in some of the positive cultures. Also the presence of organisms that produce penicillinase[11] may interfere with penicillin action.

The fact that sodium thioglycollate and clarase culture tubes yielded a higher positive count is not significant, since a mathematical chance of bacterial distribution may be responsible for this finding. Morse and Yates[12] have demonstrated that taking anaerobic cultures does not increase the percentage of positive findings. On the other hand, Buchbinder[13] claims that anaerobiosis increases the percentage of positive cultures.

The bacteriologic results obtained with this method suggest that the first treatment in all cases should be with penicillin, but if the culture is positive after the first treatment then the standard procedure of sterilization should be followed. Penicillin is not a panacea for all root canal cases but is another valu-

7. Bloomfield, A. L.; Kirby, W. M. M.; and Armstrong, C. D., A Study of "Penicillin Failures." *J.A.M.A.* 126:685 (November 11) 1944.

8. Bender, I. B., and Tassman, G. C., Antibacterial Action of Human Whole Blood upon Bacteria Isolated from Periapical Tissue: *J.A.D.A.* 28:1962 (December) 1941.

9. Burket, L. W., Studies of Apices of Teeth. *Yale J. Biol. & Med.* 9:271 (January) 1937.

10. Hobby, Gladys L.; Meyer, Karl; and Chaffee, Eleanor, Activity of Penicillin in Vitro. *Proc. Soc. Exper. Biol. & Med.* 50:277 (June) 1942.

11. Abraham, E. P., and Chain, E., An Enzyme from Bacteria Able To Destroy Penicillin. *Nature* 146:837 (December 28) 1940.

12. Morse, Fred W., and Yates, Morton F., Follow Up Studies of Root Filled Teeth in Relation to Bacteriologic Findings. *J.A.D.A.* 28:956 (June) 1941.

13. Buchbinder, M., Results of Culturing Root Canals by a Simple Anaerobic Method. *J. D. Res.* 19:426 (August) 1940.

able drug that can be used to obtain sterility of the periapical tissues.

It is interesting to note that, in putrescent cases that have a foul odor, the odor persists despite the negative culture. This finding is evidence that the odor is a result of bacterial by-products and has nothing to do with sterility of cultures. This indicts the sense of smell as a means of determining sterility.

The roentgenographic evidence is suggestive that bone repair is more rapid in these cases than in those of standard treatment. This may be attributed to the nonirritating effect of penicillin upon the periapical tissues.

Conclusions

Penicillin when used in a high concentration can sterilize effectively the periapical area with one treatment in 70 per cent of the cases, especially the acute type. This finding is borne out by the clinical, bacteriologic and x-ray evidence as presented in this study.—*1551 Champlost Avenue.*

LABORATORY AND CLINICAL STUDY OF PENICILLIN IN ROOT CANAL THERAPY

Maurice Buchbinder,* B.S., D.D.S., New York

RECENTLY the criterion of success in root canal therapy has shifted from mere evidence of clinical normality to the results of more searching tests. One of these tests is the complete rebuilding of normal bone in the original area of rarefaction over the root apex. Such a study[1] was reported in 1941, and indicates the long term value of root canal cultures. Grossman[2] averages the number of visits needed to establish sterility of the canal, and compares different drugs on that basis. It should be stressed that the selection of any one drug or procedure as advantageous ordinarily requires an adequate number of cases, including controls, properly balanced in distribution, and statistically analyzed for significance.

Penicillin is an interesting drug for use in the local infection which is the basis of root canal therapy. The specific susceptibility of the infective organism to penicillin must be tested. Important groups of pathogens are untouched by penicillin. Florey[3] reports great variability in strains of streptococcus viridans to the action of penicillin, one being 200 times as sensitive as another tested.

A. Penicillin Sensitivity of Organisms

Root canal organisms are a varied group. Streptococcus viridans strains are predominant, but staphylococcus infections are not rare. There are comparatively few known gram-negative organisms involved, which, it is recognized, are penicillin resistant. The laboratory

*Former associate professor of root canal therapy, Department of Operative Dentistry, Columbia University.

1. Buchbinder, Maurice: A Statistical Comparison of Cultured and Non-Cultured Root Canal Cases. J. D. Res. 20:93, April 1941.

2. Grossman, L. J.: Antibiotic Agents in Root Canal Work. New York J. Den. 15: June and July 1945.

3. Florey, H. A.: Further Observations of Penicillin. Lancet. 241:177, 1941.

technic adopted for the studies reported here is a convenient modification of the original Florey procedure, itself evolved from the old agar cup method[4] long used for testing bacteriostasis in the Department of Agriculture. Standard minute amounts of dry penicillin are prepared by desiccation of drops of solution calculated to give any desired potency. These drops are placed on discs of sterile blotting paper 5 mm. in diameter. Each disc contains 5 to 15 Oxford units as desired. The wet disc is immediately dried in the icebox in a chemical dryer. The discs, unlike the solution, are stable in the icebox for at least several weeks, and probably for longer. Enough discs can be made at one time for future work. The advantage of avoiding the need for preparing fresh solutions for each day of testing is obvious.

Organisms are tested by inoculating them into brain-heart agar (Difco) which is then poured into three-inch Petri dishes at just above the congealing temperature. Three or four penicillin discs, or a plain sterile disc holding the bacteriostatic to be tested, are spaced on the dish in such a way as to allow for the independent action of each disc (Plate 1). After incubation, a circular zone without any colonies appears around the penicillin area. This inhibitory effect is measured by the diameter of the zone in millimeters. The strain of the infecting organism, the strength of the penicillin, or the bacteriostatic tested may be varied. Florey[3] has pointed out that if more than minute amounts of penicillin are used, the curve of the inhibition diameter does not rise in proportion, but flattens out sharply at about 10 units. Unless this is kept in mind, an underestimation of the bacteriostatic power of penicillin will be made.

Tests for the stability of the discs were reassuring. Table 1 summarizes the data

4. U. S. Department of Agriculture. Circular 198, December 1931.

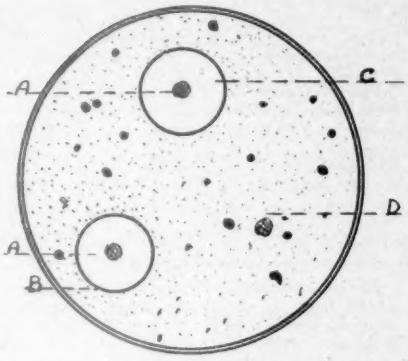

Plate 1.—Agar plate-disc bacteriostatic test. (A) Blotting paper discs carrying medication. (B) Clear zone from 5 units of penicillin. (C) Clear zone from 15 units of penicillin. (D) No zone from 50 micrograms of tyrothrycin

on inhibitory comparisons. It is seen that penicillin is a more powerful bacteriostatic than the other drugs tested. Table 2 is a résumé of the data on the effects of other drugs when in contact with penicillin.

B. Tissue Irritation

It was decided that a strong solution of penicillin should be used topically in the root canal. This was done in order to compensate for the solubility and diffusibility of penicillin and its decomposition rate at body temperatures. Some root canals have extremely fine apical openings, and the stronger the solution used, the greater the diffusion. Although local irritation following the use of concentrated solutions of penicillin was unknown, the powder is stated to be irritating to wound surfaces.[5] Therefore the Black forearm test[6] was administered after first scratching the skin on the subject's arm. A thick paste of penicillin and water was applied, covered with thin rubber and adhesive tape, and kept in

5. Merck and Co. Story of Penicillin, p. 28, 1944.

6. Black, G. V.: Operative Dentistry. Chicago: Medico-Dental Publishing Co., 1936. Vol. 4, p. 414.

Table 1.—Summary of inhibitory comparisons

Drug	Inhibition Zone	Weight Used	Organism
Penicillin	30 mm.	10 micrograms	Mixed Saliva
Sodium Hypochlorite	0	100	"
Hexylresorcinol	0	10	"
Iodine	0	70	"
Eugenol	12.5	5000	"
Phenol	10	5000	"
Tyrothricin	0	50	"

Sodium hypochlorite 1 per cent was used as Zonite, the iodine as U.S.P. tincture, the phenol as liquefied, the eugenol in full strength, and the tyrothricin (Dubos) is a suspension with 2.5 milligrams per cubic centimeter.

Weight calculations are of the pure material actually placed on the agar plate in each case. Listed densities of the materials in liquid form were used, and drops per cubic centimeter counted when needed. The error factor cannot be important as compared with the relative quantities involved.

place for 24 hours. A similar test was made at the same time, using eugenol as a control. Neither site on the subject's arm showed any irritation. Each scratch healed and appeared sterile at all times.

Although the known properties of the drug minimized the possibility of systemic effects, further tests were made on two subjects by injecting each with 3000 Oxford units of penicillin dissolved in one 2.4 cc. cartridge of 2 per cent Cook-Waite procaine with cobefrin. The injection site was above the root apex, and anesthesia was complete. The impression was given by both subjects that the after soreness at the site of the injection was less than usual. There were no systemic effects.

C. Method of Use

To avoid confusion of interpretation, only topical dressings were used in the root canal. Injection of strong doses of the drug, in a procaine vasoconstrictor solution, over the apex of an infected tooth appears to be a rational way of employing penicillin; but this method of administration would require blood penicillin determinations beyond the scope of a dental office. The paper disc experiments suggested the best method of use in root canal therapy. Preparation of thick solutions at the dental chair would be messy, wasteful and rather unsatisfactory, because of the small quantities involved and the hygroscopic nature of the drug, as well as the need for sterility. It was possible to dry from 1000 to 5000 Oxford units on previously cut to length sterile absorbent cotton root canal points. A batch is prepared at one time, calculating doses to give the desired strength. The points are desiccated immediately in the icebox. Any fair sized flat topped sealable vessel will act as a dryer with potassium hydroxide as the drying agent (Plate 2). The points are made at one's leisure, under sterile condi-

Table 2.—Résumé of repeated tests

Drugs Which Rapidly Destroy Penicillin:	Sodium Hypochlorite 1% Tincture of Iodine U.S.P Peroxide of Hydrogen 2%
Drugs Which Have a Less Marked Effect:	Hexylresorcinol Eugenol C.P. Phenol (liquefied) C.P.
Drugs Which Have No Effect:	Procaine Procaine 2% (with cobefrin)
Drug Which Could Not Be Tested:	Formaldehyde (solution U.S.P.)

tions, and kept in the icebox for future use. An occasional few hours exposure at room temperature should not appreciably reduce the potency, so long as the points are dry.

D. Antagonisms to Penicillin

Penicillin is reactive and sensitive to oxidation. Some of the commonly used drugs and washes for root canal work are oxidizing agents. Their use on the same day with penicillin might inactivate the latter. Therefore, the more important of these were tested for their effect on penicillin, with varying exposure times. The experiments were conducted by exposing the standard dry penicillin disc to small quantities of the various drugs (enough barely to cover the disc) in their usual strengths. The drugs were renewed occasionally to compensate for evaporation. At the end of the exposure time, the disc was placed on infected agar, together with a standard disc and a plain disc wetted with only the drug being tested, as controls. After incubation, a marked reduction of the inhibition diameter around the treated penicillin disc revealed a loss of potency due to the drug tested. The plain wetted disc revealed whether the drug itself was sufficiently active in the concentration used to mask the effects of the penicillin. Twelve per cent aqueous solution of formaldehyde does this and cannot be tested in this manner.

As expected, the oxidizers and products containing active chlorine destroy penicillin rapidly. Others seem to hinder or injure it more slowly. Procaine has no apparent effect. Table 2 presents the data.

E. Clinical Use and Evaluation

In the first case treated, the topical use of dressings containing penicillin in great concentration produced such a startling result that it was decided to study the treatment in such a way that its value could be established as promptly as possible. When penicillin was first applied clinically in major infections, it was restricted to those patients who were already moribund, on whom all other known remedies were useless, and whose illnesses were known to be largely fatal. Root canal infections, of course, are not in this category. Nevertheless, the experienced observer can recognize cases with poor prognosis, or those where standard treatment is known to be long. For example, children's teeth with unclosed apices, once infected, are likely to entail long periods of treatment. Other complicating symptoms occur occasionally, such as tender teeth that cannot be sealed without pain and must be left open for long periods. It was decided to restrict the use of penicillin to teeth of this general type, which were known to have given trouble, or which promised by their histories to do so.

Case 1

A boy, aged 9, had the partly vital pulp, exposed by an injury two months previously, removed at the first sitting. A eugenol dressing was sealed into the canal with zinc oxide. It was necessary to open the canal at home because of pain and diffuse swelling. At the fifth visit, the canal discharged pus and there was only slight improvement. A dry penicillin point of 1200 units was sealed into the canal. At the next visit the drainage of pus had ceased entirely. A culture was taken in brain-heart infusion (Difco). It was sterile. During four additional sittings

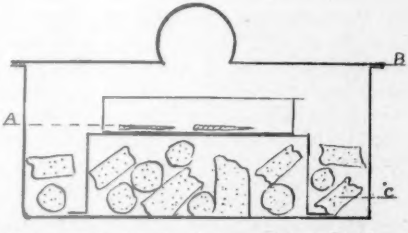

Plate 2.—Desiccator (schematic). (A) Absorbent cotton points with 1,000 units of penicillin. (B) Vaseline seal. (C) Potassium hydroxide sticks

Fig. 1.—Traumatized tooth with incompletely formed apex

Fig. 2.—Lower right cuspid with large roentgenographic area

the canal was filled. A roentgenogram is shown (Fig. 1). In appraising this case it must be borne in mind that no coagulating drug was used which might have accounted for the sudden dryness. Obtaining a sterile culture after only one dose of penicillin is highly significant in a case of this kind. Similar cases totaled 20 or more visits before comparable results were obtained. Possibly an organism highly sensitive to penicillin, such as the staphylococcus, was involved.

Case 2

A woman, 42 years of age, was referred by a dentist who had opened her lower right lateral incisor and left it open. There was moderate local swelling and tenderness. At the third visit the canal was closed with penicillin. A sterile culture was obtained at the seventh visit. The canal, filled at the ninth visit, is shown in Figure 2. This patient became comfortable soon after treatment began, but a sterile culture was not obtained until penicillin had been used four times.

Case 3

A woman, 38 years of age, was referred with a complete history. Her upper right central incisor had been treated six times, from February 13 to May 8, 1945. Formocresol (orthocresol 40 per cent and solution of formaldehyde 60 per cent) had been used and it had not been possible to keep the canal closed. At the first visit apical swelling and tenderness were noted, as well as tooth tenderness, an open canal unclogged at the apex and drainage of pus. The canal was cleansed and irrigated freely by placing a dry penicillin point in the canal and adding sterile water. By telephone the patient reported great improvement on the following day. The canal was then sealed with 1200 units of penicillin. The patient is now quite comfortable, the apical swelling is gone and the tooth tenderness is almost gone. Such a striking change in one treatment, following weeks of unbroken pain and swelling, appears to be extremely significant (Fig. 3).

Case 4

The patient was a woman, 53 years of age. At the first visit the lower right first molar was opened and left open. The tooth was elongated and tender and there was a large apical roentgenographic involvement. It was sealed with penicillin at the third visit, and a sterile culture was obtained from the distal canal at the fourth sitting. The patient is still under treatment. She is comfortable and there is no swelling. This case is inter-

Fig. 3.—Chronically infected upper right central incisor

esting because of the rapid sterility achieved despite a severe involvement. The canal was filled and roentgenographed since reporting the case (Fig. 4).

Case 5

A woman, aged 19, was referred to the office following protracted treatment for her two lower central incisors. One canal became sterile in two visits; the other in four. Both canals had been left open by the referring dentist because of pain. A roentgenogram is shown. This case is interesting because of extensive apical involvement and because of the rapid sterilization following the use of penicillin. Since reporting this case, a roentgenographic examination was made (Fig. 5).

Case 6

The patient was a man, aged 35, whose lower right first bicuspid showed severe pericementitis with pulp necrosis. The pulp was removed at the first sitting and the canal was dressed with penicillin and left open. During the second visit it was sealed with 1200 units of penicillin. At that time all pain had ceased. There has been no sterile culture, after two additional dressings, but the patient is completely comfortable and there is little drainage. Treatment is continuing.

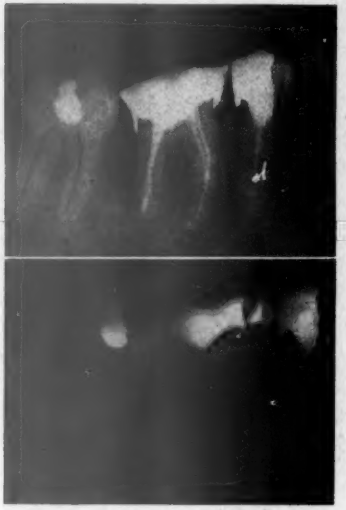

Fig. 4.—Roentgenograms of lower right first molar taken seven months after treatment

Case 7

The patient, a man, 40 years old, had had his lower right central incisor treated several times with a saturated solution of iodine crystals in beechwood creosote. It was sealed on the day before he was referred by his dentist. Very severe pain and tenderness resulted. At the first visit there was a profuse bloody discharge. A penicillin point was placed in the canal which was left open. On the second visit there was only slight tenderness and the canal was still draining. At the third visit it was nearly normal and was sealed with penicillin. By the next two

Fig. 5.—Roentgenograms of lower central incisors taken five months after treatment

visits all pain and tenderness had gone, but the culture was not yet sterile. This case is interesting because of the severity of the symptoms, the attempt and inability to close the canal with iodine in creosote and the striking change following the use of penicillin.

Several other incipient cases were treated in a similar manner. They responded rapidly. It is significant that in all cases treated with massive doses of penicillin, there has been no instance of irritation.

Summary

No irritation has thus far been encountered. This, coupled with the Black forearm test results, and the known properties of the drug in other fields, makes it appear to be quite safe to use large doses (1000 to 3000 units) of penicillin in the manner described, pumping freely past the root apex. At least four of the cases presented were so striking in their courses that it is difficult to avoid attributing the success to concentrated doses of the drug used locally. The accumulation of data for a conclusive evaluation is continuing. Oxidizing drugs such as Dakin's solution, hydrogen peroxide or iodine-containing medications should not be used simultaneously with penicillin. If used on the same day, they should be thoroughly removed by drying before the penicillin point treatment is applied.

Procaine apparently has no harmful effect on the bacteriostatic properties of penicillin.—*150 West Fifty-Fifth Street.*

CORRECTIONS

In the article "The Anatomy of Mandibular Anesthesia" by Harry Sicher, which appeared in the December 1 issue of THE JOURNAL, the two lines of lettering indicating the lingual nerve and the inferior alveolar nerve in Figure 5 were transposed.

In the report of the Council on Dental Health, "Dental Program Under Health Insurance Outlined in Report of Social Security Board," appearing in the December 1 issue of THE JOURNAL, the signature of Allen O. Gruebbel, secretary of the Council, was incorrectly placed. It should have appeared at the end of the introduction to the report of the Social Security Board.

THE Journal OF THE
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HAROLD HILLENBRAND, D.D.S., *Editor*

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EDITORIALS

DENTISTRY IN THE VETERANS ADMINISTRATION PROGRAM

FORTY-SEVEN of the state dental societies and the District of Columbia and Puerto Rico have now completed state-wide agreements with the Veterans Administration in order to provide dental care for those men and women who have served their nation in the armed forces. These agreements were negotiated individually at the state level in order to accommodate the very wide differences in conditions of practice that exist in various parts of the United States. These agreements permit any dentist meeting certain minimum conditions to be approved as a "participating dentist" who is eligible to receive patients from the Veterans Administration. They also include a state-wide fee schedule which has been adjusted to meet local conditions and problems.

After World War I, patients from the Veterans Administration were referred only to a limited number of "designated dentists" in each area. This method often prevented the patient from returning to, or seeking, the dentist of his choice. Operations were performed on the basis of an inelastic "national" fee schedule. Preliminary reports indicate that the new state level programs are winning wider approval from both beneficiary and profession than did the former federal level programs.

The dental program of the Veterans Administration has important implications for both the public and the dental profession. Eventually, it will serve more than twelve million persons, an important segment of the population. It will help to demonstrate the essential role of private practice in future programs designed to provide dental care for other groups in the nation. It will provide a ready index of the quality and quantity of dental care that can be given in a program that does not infringe upon the professional independence of dentists. It can prove beyond the point of discussion the value of a dental health program in any plan that con-

siders the total health of an individual or group. It can serve as a deterrent to undesirable programs by proving its own efficiency and practicability.

The American Dental Association has recognized these possibilities in working toward a satisfactory development of a dental program for veterans. It has aided in the development of a fee schedule but it has allowed final judgment on it to rest with the state dental societies whose members must actually render the care. It has urged the use of the existing mechanisms in private practice as the most effective way to establish a sound, continuing program. It has, finally, urged the use of Veterans Administration facilities for much-needed opportunities in graduate and postgraduate dental education.

With these things in view, dentists should cooperate in the development of their own state program to the end that no veteran finds it impossible to procure needed dental care. Dentists, of course, should make every effort to re-attract to their practices those veterans who were patients before the war. Additionally, they should endeavor in every way possible to include new patients who may request their services. Even in these days of crowded appointment lists, such a program would soon care for an increasing number of veterans and would, as well, disarm those whose plans for the future do not include the use of the private practice system.

CONFERENCE ON DENTAL SERVICES FOR CHILDREN

The problem of expanding dental services for children is one of the integral components of the greater problem of establishing a truly effective program of dental prevention and control. There is some evidence that the availability of service to children is being outstripped by the results of increasingly effective dental health education as well as by other factors. When this imbalance occurs and dental service is not available to the child who needs it, a cycle of undesirable results is initiated. First, the parents of such a child have good cause to wonder if the dental profession actually believes that treatment in the early years of life pays off in dividends of increased comfort, health and appearance. Second, the stimulation of a demand for a service which is not available ultimately will frustrate the real purposes of dental health education.

In order to interrupt this cycle through a planned program, the Council on Dental Health of the American Dental Association and the American Society of Dentistry for Children are sponsoring a Conference on Dental Services for Children, to be held in Chicago on February 9. The Conference will attempt to develop recommendations for an intensive study of this problem with special emphasis on the selection of a group to conduct the study and to finance this worth-while project. Members of state and local councils on dental health as well as officers and members of component societies of the American Society of Dentistry for Children have been invited to attend the conference.

NEWS OF DENTISTRY

ADMIRAL SWANSON APPOINTED NAVY SURGEON GENERAL

REAR Admiral Clifford A. Swanson has been appointed Surgeon General of the Navy and Chief of the Bureau of Medicine and Surgery to succeed Vice Admiral Ross T. McIntire. The appointment was announced by President Truman together with Swanson's appointment to the rank of rear admiral. He had formerly held the rank of captain.

Admiral McIntire, former personal physician to President Roosevelt, is expected to retire. His appointment expired November 1.

Admiral Swanson, Navy Medical Corps expert in diseases of the eye, ear, nose and throat, was born in Marquette, Mich. He was graduated from the Medical School of the University of Michigan and from the postgraduate school of the University of Pennsylvania, Philadelphia. He entered the Navy Medical Corps in June 1925, with the rank of lieutenant, junior grade.

During World War II Admiral Swanson served as senior medical officer on the battleship Iowa and as medical officer on the staff of the Commander, Battleships, Atlantic Fleet. He was later chief operating surgeon and chief of the eye, ear, nose and throat department, Naval Dispensary, Washington. He represented the United States government at the Pan American Eye Congress in Montevideo, Uruguay.

He is a fellow of the American College of Surgeons and the American Academy of Ophthalmology and Otolaryngology. He was sworn in as Surgeon General December 2 by Rear Admiral O. C. Colclough, Judge Advocate General of the Navy, in the office of Secretary of the Navy James V. Forrestal.

Capt. Herbert L. Pugh, Batesville, Va., was appointed assistant chief of the Navy Bureau of Medicine and Surgery, with the rank of rear admiral.

WAR DEPARTMENT TO RECRUIT SKILLED DISABLED VETERANS

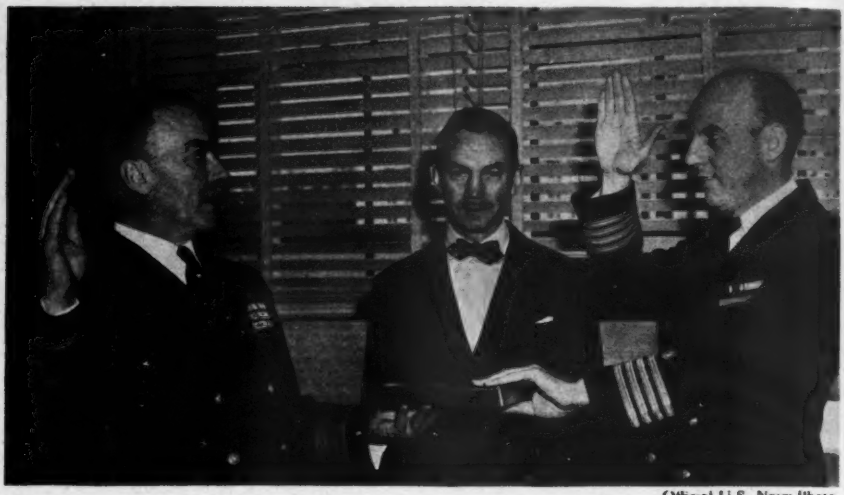
The U. S. War Department has announced a program of recruitment to bring 5,000 partially disabled veterans into Army service, in an attempt to secure skilled personnel and to offer the Army as a career to men formerly barred because of disability.

Among the positions listed by the War Department which can be filled by partially disabled veterans are those of dental laboratory technician and dental assistant. A portion of those qualified disabled men may be sent overseas.

TWO NAVY DENTAL OFFICERS TO CONDUCT MATERIALS RESEARCH

The director of the Bureau of Standards, Department of Commerce, has announced that two Navy Dental Corps officers will be accepted for assignment to the Dental Research Laboratories for training in research on dental materials.

Both officers nominated to the posts will be attached to the U. S. Naval Dental School, Naval Medical Center.



Official U.S. Navy Photo

New Navy Surgeon General Sworn In

Rear Admiral Clifford A. Swanson was sworn in by Rear Admiral O. C. Colclough, Navy Judge Advocate General, as Surgeon General of the Navy and Chief of the Bureau of Medicine and Surgery, December 2, in the office of Secretary of the Navy James V. Forrestal. From left to right above are Admiral Colclough, Secretary Forrestal and Admiral Swanson

MOBILE DENTAL UNIT CARES FOR NAVAL SHORE PERSONNEL

U. S. Navy personnel serving in the most remote outlying stations are now assured of adequate dental care at government expense through the Navy's latest health development—the mobile dental unit.

Rear Admiral A. G. Lyle, Assistant Chief of the Bureau for Dentistry in the Navy Bureau of Medicine and Surgery, is chiefly responsible for the innovation in the provision of dental facilities. Admiral Lyle first planned the fleet of nine mobile units which have been assigned to various naval districts throughout the country to take care of stations too small to have full-time dental officers and technicians.

On the seas the problem of providing dental care for men on small ships was solved through the use of dentists on tenders. But no plan for men in outlying shore stations was in use until the construction of the mobile units.

Each unit has a five-ton tractor attached to a thirty-six foot trailer. The trailer contains a gasoline-power generator capable of supplying all power for dental equipment. The trailer also contains a complete two-chair dental operating office and a waiting room which can be converted into sleeping quarters for the unit's crew.

ARMY DENTAL, MEDICAL OFFICERS TO STUDY IN CIVILIAN SCHOOLS

Eighty dental and medical officers of the Army Medical Department are at present enrolled in civilian dental and medical institutions for the ultimate purpose of providing the best health care possible to the American soldier, Maj. Gen. Norman T. Kirk, Surgeon General, announced last month. During the calendar year of 1946, more than 180 officers will have taken specialized courses in twenty-seven of the nation's leading professional institutions. Many of the courses are of three months' duration

and a few run up to a year. It is the Surgeon General's policy to assign officers to shorter courses wherever possible. Officers who take such courses will be expected to instruct their staffs in the latest technics upon their return to active duty.

Special courses for dental officers are offered in the field of prosthetic dentistry and oral surgery.

A. D. A. AFFAIRS

CONGRESS ON EDUCATION TO BE HELD FEBRUARY 8

The third Congress on Dental Education and Licensure, conducted by the Council on Dental Education of the American Dental Association, will be held February 8 at the Stevens Hotel in Chicago.

J. Ben Robinson, chairman of the Council on Dental Education, will preside at the opening sessions. Greetings will be delivered by Sterling V. Mead, president of the American Dental Association. John T. O'Rourke, director of postgraduate studies, Tufts College Dental School, will speak on "Re-Evaluation of the Dental Curriculum."

The aptitude testing program will be discussed from the standpoint of the Council by Shailer A. Peterson, director of educational measurements of the Council on Dental Education, and from the standpoint of the dental schools by Willard C. Fleming, president of the American Association of Dental Schools and dean of the College of Dentistry, University of California.

T. M. Barlow, president of the American Association of Dental Examiners, will preside at the afternoon session, and greetings will be extended by Harold Hillenbrand, general secretary of the American Dental Association. The future of the specialties in dentistry will be discussed by James R. Blayney, director of the Zoller Memorial Clinic, University of Chicago, and Harold J. Leonard, professor of periodontology, School of Dental and Oral Surgery, Columbia University.

DENTAL SERVICES FOR CHILDREN TO BE STUDIED FEBRUARY 9

The Council on Dental Health of the American Dental Association and the American Society of Dentistry for Children will sponsor jointly a conference on dental services for children, to be held February 9 during the Chicago Midwinter Meeting, at the Stevens Hotel in Chicago.

The conference will be attended by representatives of state councils on dental health, officers of state units and members of local chapters of the American Society of Dentistry for Children.

One of the chief aims of the conference will be to examine the problem of expanding dental services for children and to develop recommendations for an intensive study of the problem with special emphasis on the selection of a group to conduct the study and to finance the project.

Details of the program will be published in the next issue of THE JOURNAL.

JOSEPH RICHARDS NAMED A.D.A. ASSISTANT BUSINESS MANAGER

The American Dental Association has announced the appointment of Joseph S. Richards as assistant business manager.

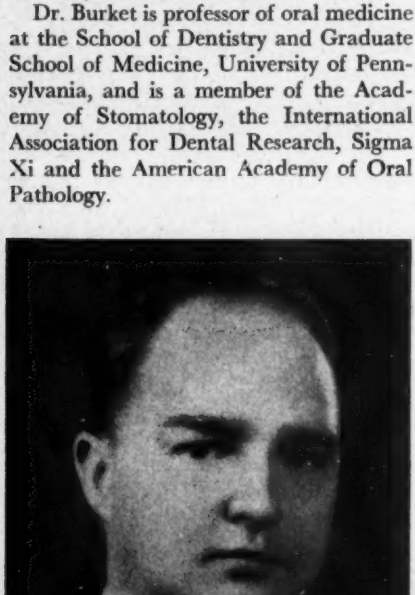
Mr. Richards received his B.S. degree from Purdue University and attended Northwestern University Medical School for one year. He has been employed at the New York Stock Exchange, the Tucker Anthony and Company brokerage in New York, the Lederle laboratories in Pearl River, N. Y., and the Rathbone, Hair and Ridgway manufacturing company in Chicago. He is a

veteran of service in the western Pacific with the U. S. Navy.

LESTER W. BURKET APPOINTED TO COUNCIL ON THERAPEUTICS

The House of Delegates has appointed Lester W. Burket to membership on the Council on Dental Therapeutics. Dr. Burket, a recognized authority on oral medicine, holds both the D.D.S. and the M.D. degrees. His field of interest is dentistry and medico-dental relations.

Dr. Burket is professor of oral medicine at the School of Dentistry and Graduate School of Medicine, University of Pennsylvania, and is a member of the Academy of Stomatology, the International Association for Dental Research, Sigma Xi and the American Academy of Oral Pathology.



New Council Member

Lester W. Burket, newly appointed member of the Council on Dental Therapeutics. Dr. Burket is professor of oral medicine at the School of Dentistry and Graduate School of Medicine, University of Pennsylvania

DENTAL SOCIETIES

CHILDREN'S DENTAL HEALTH DAY SET FOR FEBRUARY 3

The seventh annual Children's Dental Health Day will be held February 3 at the Hotel Statler in Cleveland, Ohio, under the sponsorship of the Cleveland Dental Society.

The program will feature a series of postgraduate demonstration clinics on different phases of children's dentistry presented by two students from the schools of dentistry of the University of Detroit, Indiana University, University of Michigan, Northwestern University, Ohio State University, University of Toronto and Western Reserve University.

Five limited attendance clinics and educational exhibits will be presented. Speakers on the agenda include: Roy G. Ellis, Toronto; S. S. Arnim, Columbus, Ohio; Kenneth A. Easlick, Ann Arbor, Mich.; and René Rochon, Detroit, Mich.

A special lay program will be held February 2 at the Cleveland Health Museum, where awards for the winning posters submitted in the Dental Poster Contest held in Cleveland public and parochial schools will be presented.

GERALD TIMMONS TO PRESIDE AT PHILADELPHIA MEETING

Gerald D. Timmons, dean of the School of Dentistry, Temple University, will preside at the opening sessions of the Greater Philadelphia Annual Meeting of the Philadelphia County Dental Society, to be held February 5-7.

Other speakers on the opening agenda are: Abram Cohen, president, Philadelphia County Dental Society, and chairman of the committee for the meeting; John J. Small, regional dental director, Veterans Administration; and Milon P. Eaton, president of the Pennsylvania State Dental Society.

Among the symposiums to be held is one conducted by Lester W. Burket, Schools of Dentistry and Medicine, University of Pennsylvania, on "Medicine in Relation to Dentistry." Speakers will be Carroll S. Wright, School of Medicine, Temple University; Hugo Roesler, Temple University Hospital; and John A. Kolmar, Schools of Dentistry and Medicine, Temple University.

The program includes twenty-three registered films, forty table clinics, six topic discussions and three color films on various phases of dentistry, including oral surgery.

LIMITED HOTEL SPACE FOR CHICAGO MIDWINTER MEETING

Only limited hotel facilities are still available for the annual Midwinter Meeting of the Chicago Dental Society, to be held February 10-13. Anyone who plans to attend the meeting and who has not yet secured hotel space should contact the office of the Chicago Dental Society for reservations.

Plans are under way for the largest commercial exhibit to appear at any meeting in the United States, according to L. Russell Hegland, executive secretary of the society. The society is accepting only articles of interest to dentistry for the exhibit and is adhering strictly to the standards set up by the Council on Dental Therapeutics of the American Dental Association.

The program will include forty-eight essay programs, forty-five limited attendance clinics, forty-five question and answer periods, seventy-five table clinics and a variety of health, educational and scientific exhibits. The officer in charge of each exhibit will give a talk explaining the material at a specified hour each day.

Among the speakers on the essay program are: Cmdr. Carl A. Schlack, National Naval Medical Research Institute, on "Oxalic Acid in Relation to Dental Caries"; Charles W. Freeman, dean of the Dental School, Northwestern University, on "Local Anesthesia"; Ray Ellis, University of Toronto, on "Fractures of Young Permanent Anteriors"; and H. A. Zander, Boston, on "Pulp Reactions to Silicate Cements."

LATEST DENTAL SOCIETY ACTIVITY AND MEETINGS

Alabama.—The Alabama Dental Association will hold its seventy-eighth annual meeting in Birmingham April 8-10, 1947, George W. Matthews, secretary-treasurer, has announced.

California.—The California State Board of Dental Examiners will hold the next examination for dental licensure February 10-14 at the College of Dentistry, University of California, San Francisco. Applications and fees must be filed on or before January 21 and should be addressed to Kenneth I. Nesbitt, secretary, Board of Dental Examiners, Room 203, 515 Van Ness Ave., San Francisco 2.

The California State Dental Society will hold its annual meeting in San Francisco April 28-30, L. E. Linehan, secretary, has announced.

Kentucky.—The Kentucky State Dental Association will hold its 1947 meeting from March 31 to April 2 in Louisville, according to J. L. Walker, secretary.

Louisiana. — The Council on Dental Health of the Louisiana State Dental Society has announced that dentists in Districts Three, Six and Eight have completed arrangements for a survey to determine the dental health status and dental needs of school children. The program in these three districts is part of a state-wide survey now being conducted by the Council in cooperation with the State Health Department.

J. S. Bernhard, secretary of the state dental society, has announced that the annual meeting will take place in New Orleans April 10-12.

Massachusetts.—The Massachusetts Board of Dental Examiners will hold its next examination February 10-12. Applications must be filed with John C. Wilson, secretary of the board, 413N State House, Boston, at least two weeks before the date of the examination.

Michigan.—The State Board of Dental Examiners will meet February 3 in Ann Arbor, according to H. T. Wood, Detroit, secretary.

The Michigan State Dental Society will hold its annual meeting in Detroit, April 14-16. H. C. Gerber, Jr., Lansing, is secretary of the state society.

Montana.—A course in "The Practice of Dental Medicine" will be presented at the midwinter dental meeting, January 22-25, in Billings, sponsored by the Committee on Dental Medicine of the Yellowstone Valley Dental Society.

The course will be conducted by Hermann Becks, professor of dental medicine at the College of Dentistry, University of Montana, and research associate in the Institute of Experimental Biology, University of California. The course will deal with the prevention and prognosis of dental caries and paradentosis, relationships of endocrine disturbances to oral diseases, and normal and pathologic bone formation.

Puerto Rico.—The annual meeting of the *Colegio de Cirujanos Dentistas* of Puerto Rico will be held January 23-26 at the Condado Beach Hotel, San Juan, P. R., Ramon Miranda, secretary, has announced.

Rhode Island.—The Rhode Island State Dental Association will hold its annual meeting January 20-22 in Providence, according to M. S. Messore, secretary.

Among the features on the program will be a symposium on "The Lower Third Molar," by William I. Ogus, Washington, and Harold A. Kent, Frank W. Rounds and Max H. Jacobs, all of Boston. Charles F. Bodecker, professor emeritus, Columbia University, will speak on "Clinical Importance of Oral Histology."

Wisconsin.—Examinations for licensure in Wisconsin will be conducted by the State Board of Dental Examiners February 10-14 in Milwaukee, according to S. F. Donovan, secretary. The next annual meeting of the Wisconsin State Dental Association will be held March 31 to April 2 in Milwaukee, K. F. Crane, secretary, has announced.

DENTAL SCHOOLS

DR. FRIESELL SUCCEEDS BROTHER AS PITT DEAN

Frederick C. Friesell, Pittsburgh, has been appointed acting dean of the School of Dentistry, University of Pittsburgh, by the board of trustees of the University. He succeeds his brother, H. Edmund Friesell, who died October 27.

Dr. Friesell has been professor of histology and bacteriology and secretary of the University dental faculty since 1904. He is chairman of the Pittsburgh section of the American Association for the Advancement of Science and a member of the International Association of Dental Research.

H. Edmund Friesell was professor of operative dentistry at the University and a past president of the American Dental Association.

POSTGRADUATE COURSES ARE GIVEN AT WESTERN RESERVE

A series of postgraduate courses for graduate dentists who are members of the American Dental Association is being given at the School of Dentistry, Western Reserve University, Cleveland, William L. Wylie, dean, has announced.

A course in root canal therapy and another on dental caries control are now being presented, and a course in pedo-

dontics will be offered from February 3-14. The course on dental caries deals with facts and fallacies, dietary control, effects of antibiotics and germicides, saliva, fluorine and heredity.

ILLINOIS ESTABLISHES FOUR GRADUATE STUDY FELLOWSHIPS

The graduate school of the University of Illinois has announced the establishment of four research fellowships to be awarded for one year in the fields of dentistry, medicine and pharmacy in Chicago.

The fellowships will carry a stipend of $1,200 a year and may be renewed in competition with new applicants. Candidates for the fellowships must have completed not less than eight years of training beyond high school graduation.

Candidates should indicate the field of research in which they are interested. Appointments will be announced around January 1 each year. The fellowship year begins September 1 or July 1. Application blanks may be secured from the Secretary of the Committee on Graduate Work in Medicine, Dentistry and Pharmacy, 1853 Polk St., Chicago 12.

DR. HORNER PREDICTS FUTURE OF DENTISTRY IN HEALTH CARE

Dentistry faces almost unlimited opportunities for health service all over the world, Harlan H. Horner, secretary of the Council on Dental Education, said in a recent commencement address to the graduating class of the School of Dentistry, St. Louis University.

Less than one-fourth of the American people are now receiving adequate dental care in any year, Dr. Horner said. He predicted that dentistry would concentrate on prevention of dental disease through the extension of health service to more people.

"Restoration has been our keynote for a hundred years. Prevention, without any lessening of restoration, must be our keynote for the next hundred years," he said.

Dr. Horner called the failure of society to extend health services to all peoples "the greatest moral crime of modern society."

NEW PATHOLOGY PROGRAM IS SET UP AT DETROIT SCHOOL

A reorganization of the University of Detroit pathology department, along with plans to cooperate with Wayne University and the Detroit Receiving Hospital in instruction and reseach, has been announced by the Rev. John A. Ryan, S.J., director of laboratory courses in the department of basic medical sciences.

Father Ryan announced that the clinical department will cooperate with the department of pathology both in dental cases and in problems of general health which have a bearing on dental health. Under the new pathology program, dental students at the University of Detroit, as well as at Wayne University and the Receiving Hospital, will attend at least four autopsies a year.

Plans are under way to institute a program of special research for upper class dental students under the supervision of the pathology department.

TWO DENTAL FELLOWSHIPS ON PERIODONTIA ARE ANNOUNCED

Applications are now being accepted at the College of Dentistry, University of Illinois, for two dental research fellowships made available by the U. S. Public Health Service for the study of periodontal disease. Complete information may be obtained from Isaac Schour, College of Dentistry, University of Illinois, 808 South Wood St., Chicago 12.

The Public Health Service, at the suggestion of Dr. Schour, has also granted $11,000 and established two fellowships for research toward the setting up of an

index to determine gingival disease. Accepted applicants for the fellowships may also do part-time work toward a graduate degree.

WORLD DENTISTRY

SEEK BACK-ISSUE JOURNALS FOR WAR-DEVASTATED COUNTRIES

In an effort to aid the United Nations Relief and Rehabilitation Administration in reassembling dental files in war-devastated countries, the American Dental Association, through its Committee on International Relations, is seeking back-issues of THE JOURNAL.

Issues most seriously needed are the following: April, May and June, 1941; May, June, July and October, 1942; January 1943; April 1944; and March and April, 1945.

Dentists wishing to help this cause can do so by sending back issues of THE JOURNAL to the Committee on International Relations, American Dental Association, 1678 Primrose, Road, N. W., Washington. Donors will receive seventy-five cents for each copy.

URUGUAYAN DENTAL SOCIETIES FORM UNIFIED ORGANIZATION

The unification of the four separate dental societies in Uruguay into one national organization, the *Asociacion Odontologica Uruguaya,* was announced recently by Julian Safi, secretary of the *Centro de Odontologica del Uruguay,* one of the groups to join the new association.

The other societies which merged to form the national association are the *Sociedad de Estudios Odontologicos de Montivideo,* the *Sindicato Odontologico del Uruguay* and the *Asociacion Odontologica Nacional.*

A greatly expanded program of dental activities in Uruguay is planned.

Studies Dental Progress
Howard K. Worner, Dental Research Fellow at the University of Melbourne, Australia, has just finished a world tour to observe developments in dental research and the standardization of dental materials

AUSTRALIAN DENTIST STUDIES WORLD PROGRESS IN RESEARCH

Howard K. Worner, Dental Research Fellow at the University of Melbourne, Australia, has just completed a world tour to observe developments in the fields of research and the standardization of dental and surgical materials. The traveling fellowship, granted by the Commonwealth Department of Health, Australia, included four months in England, a week in Switzerland and three months in the United States.

Dr. Worner spent most of his time in this country studying the work of the American Dental Association Research Commission's Fellow at the National Bureau of Standards and the work of the Council on Dental Therapeutics and the Bureau of Chemistry of the American Dental Association.

Dr. Worner has been appointed dean

of the School of Metallurgy at the University of Melbourne. He is also serving as Honorary Director of the Dental Standards Bureau of Australia.

PUBLIC HEALTH

A.D.A. OFFICIALS TAKE PART IN PUBLIC HEALTH MEETING

Three officials of the Central Office staff of the American Dental Association were among the participants in the recent seventy-fourth annual meeting of the American Public Health Association in Cleveland, Ohio.

Harold Hillenbrand, general secretary, spoke at a luncheon meeting of the dental health section, which was attended by thirty-five Cleveland dentists in addition to the dental delegates. Lon W. Morrey, director of the Bureau of Public Relations, took part in the sessions of the governing council of the American School Health Association, which met concurrently with the Public Health Association.

Allen O. Gruebbel, secretary of the Council on Dental Health, was the opening speaker at the scientific sessions of the dental health section. Dr. Gruebbel recommended expansion of community health programs to provide every child with dental care, regardless of income or location.

He urged that dental care for children be integrated with all general health programs and that it include dental health education as well as dental treatment. The dental profession, according to Dr. Gruebbel, faces the problem of making dental practice in smaller cities and rural areas more attractive to secure a better distribution of dentists.

Other dental speakers included: Ernest A. Branch, Raleigh, N. C., North Carolina state dental director; Fred Wertheimer, Lansing, Mich., Michigan state dental director; John W. Knutson, U. S. Public Health Service; Peter J. Warren, Lakewood, Ohio; Lester A. Gerlach, Milwaukee, director of the dental division, Milwaukee Health Department; Norman F. Gerrie, Kansas City, Mo., dental consultant for the U. S. Public Health Service; Philip E. Blackerby, Jr., Kellogg Foundation, Battle Creek, Mich.; and J. M. Wisan, Trenton, N. J., New Jersey state dental director.

The American Dental Association exhibit on cancer of the mouth was also displayed at the meeting.

NEW OFFICERS ELECTED TO APHA DENTAL HEALTH SECTION

New officers of the Dental Health Section of the American Public Health Association were elected at the association's meeting in Cleveland last November.

The new officers are: Walter J. Pelton, U. S. Public Health Service, Denver, president; Frances A. Stoll, Columbia University, New York, vice-president; Lester A. Gerlach, dental director, Health Department, Milwaukee, secretary; and Thomas Clune, State Department of Health, Providence, R. I., member of the section council.

FELLOWSHIPS IN HEALTH EDUCATION ARE OFFERED

The Federal Security Agency of the U.S. Public Health Service has announced that fellowships leading to a master's degree in public health in the field of health education are being offered to any qualified citizen between the ages of 22 and 40.

Tuition, travel expenses for field training and a stipend of $100 a month will be provided from funds furnished by the National Foundation for Infantile Paralysis.

Candidates must hold a bachelor's degree from a recognized institution and must be able to meet the entrance requirements of the accredited school of public health of their choice. Courses

in biologic sciences, sociology and education may be required for candidacy.

The year's training begins with the 1947 fall term and consists of eight or nine months of academic work, including public health administration, epidemiology, public health and school education, community organization and information technics, and three months of supervised field experience in community health education activities.

Application blanks may be secured by writing the Surgeon General, U. S. Public Health Service, Washington 25, and must be filed before March 15.

GENERAL NEWS

GERMAN DENTISTS USED PLASTIC BASE FOR PERMANENT FILLINGS

Acrylic resin, which is widely used in the United States as a base for dentures, crowns and inlays, was successfully developed as a permanent filling for direct use by Germany during the war years, Maj. Gen. Norman T. Kirk, Surgeon General of the Army, has announced.

The substance was used in a quick-hardening plastic state in prepared cavities, General Kirk said. Development of the material was halted in Germany by destruction of the factory in 1943, but had already been used experimentally at that time. Fillings inserted in 1943 were found in excellent condition in 1945, according to the report from the Surgeon General's office.

A survey of dental developments in Germany during the war was conducted by an officer from the Surgeon General's office, but disclosed little else of value to the dental profession in the United States. Some progress was made in the field of dental materials, largely because of the necessity of finding substitutes for unobtainable materials, rather than in a search for superior products, according to the report.

Stainless steel was widely used as a substitute for scarce gold and silver. No new plastics were found, although some already known in the United States were put to novel use, such as acrylic resin.

General Kirk said that the study of German dental conditions revealed the fact that Germany apparently had no authorized standards for dental materials and remedies. Many preparations of doubtful value, and some of no value at all, were widely advertised and used. The study showed that gum diseases were common among the German population, and that apparently very few Germans had ever had their teeth cleaned.

TWO ORGANIZATIONS OPPOSE ANTIVIVISECTION ACTIVITIES

The American Diabetes Association and the U. S. Chamber of Commerce have both taken stands recently against antivivisection activities. The American Diabetes Association appealed to enlightened citizens to refrain from supporting antivivisection activities on the basis of the role played by animal experimentation in the development of insulin.

The Chamber of Commerce, in a statement of policy issued by Howard Strong, secretary of the Health Advisory Council, endorsed animal research. The statement read: "In view of the great progress that has been made in preventive and curative medicine and surgery through animal research and the prospect of even greater progress in the future, the National Chamber is unavoidably opposed to the prohibition of this scientific procedure."

BRITISH PHYSICIANS POLLED ON NATIONAL HEALTH SERVICE ACT

Mail ballots have been sent out from the British Medical Association to approximately 58,000 practitioners in the United Kingdom asking whether they

will help to carry out the provisions of the National Health Service Act which has passed Parliament and become law.

The Act is scheduled to take effect on April 1, 1948. Every practitioner listed in the British Medical Registry is being polled, regardless of whether he belongs to the medical association. The physicians are being asked to answer "yes" or "no" to the question: "Do you desire the negotiating committee (of the British Medical Association) to enter into discussions with the Minister on regulations authorized by the National Health Service Act?"

The Act provides for the establishment of a central health services council and standing advisory committee under the direction of a Minister of Health. The duty of the Minister, through the central administration, will be to provide hospital, specialist and general medical and dental services of all kinds at hospitals, health centers and clinics and at the home of the patient.

According to the Act, the Minister of Health will take over the ownership of all present public hospitals, with a few exceptions, and will set up and administer a hospital endowments fund.

Medical and dental schools will not be transferred to the control of the Minister of Health.

Patients who wish to pay for their own hospital, dental or medical care may be accommodated and will pay fees subject to a maximum scale fixed by the Minister of Health.

Provision will be made through local health authorities for health centers, maternity and child welfare, health visiting, home nursing, vaccination and immunization. Each local health authority is required to submit its proposals for carrying out the requirements of the Act to the Minister, the regional boards and the boards of governors, to the executive council and to any voluntary health organization within the area.

General dental and medical services will be arranged through local councils to be appointed by the Minister and through local dental, medical and health committees. The councils will enter into contracts with the general dental and medical practitioners for their services throughout the area. The council service will include: publication of lists of practitioners who will provide services, the conferral of the right of any person to choose his attendant subject to the consent of the practitioner, and the allocation of persons who do not specify a physician or dentist among the practitioners available.

The position of dentists under the Act will be similar to that of physicians except that there are no provisions prohibiting the sale of the good will of a practice nor compensation for its loss, and the distribution of dentists will not be regulated.

VETERANS

LAW REQUIRES CHANGE IN HANDLING G.I. INSURANCE

The Veterans Administration has urged all veterans who have National Service Life Insurance to consider carefully the settlement provisions of their policies and to designate beneficiaries for the insurance.

The Insurance Act of 1946, according to the Veterans Administration, opened a large field of new settlement options designed to provide for the various needs of veterans' beneficiaries. The optional settlements range from lump sum payments to monthly installments during the life of the first beneficiary.

The Act also changed the automatic order of succession with regard to beneficiaries, so that the veteran who does not designate beneficiaries may expose his dependents to unnecessary expense and delay, the Veterans Administration said.

FEDERAL AGENCIES

TWENTY-THREE DEVICES OF INTEREST TO DENTISTS ARE PATENTED IN PERIOD FROM JULY 1 TO OCTOBER 31

A total of twenty-three devices of interest to the dental profession were patented in the four-month period, July through October. The list of patents issued by the U. S. Patent Office during that time follows:

	July 2	
2,403,074	Bertram J. Goldsmith	Hypodermic Injection Device
2,403,172	Walter S. Crowell and George W. Birch	Art of Molding Resins of Vinyl Type
2,403,366	Kalman Horvat	Jaw Gauge for Dental Treatment
	July 9	
2,403,537	Clarence G. Maxson	Headrest for Chairs
	July 16	
2,404,225	Samuel T. Green	Protective Apron
2,404,316	Anni Sack	Ampoulla Syringe
2,404,327	John C. Tighe	Artificial Tooth
	July 23	
2,404,683	Harry Barishman	Dental Device
2,404,684	Harry Barishman	Dental Tray
	July 30	
2,405,029	Irving B. Gallanty and Robert M. Larsen	Tongue Cleaning Device
	August 20	
2,406,063	Walter S. Crowell	Dental Cement
2,406,113	Samuel R. Silver	Method of Grinding Teeth
2,406,129	John Henry Blease	Anesthetizing Metering Apparatus
2,406,208	Reiner W. Erdle	Ceramic Article and Material and Method of Coloring or Shading the Same
	August 27	
2,406,527	Joseph D. Berke	Orthodontic Appliance
	September 24	
2,408,323	Marshall L. Lockhart	Hypodermic Syringe
	October 22	
2,409,656	Harold S. Austin	Hypodermic Syringe
2,409,718	Foster Dee Snell and Kurt W. Haeseler	Composition for Cleaning Dentures
2,409,783	Moskos S. Moskey	Process for Forming Artificial Teeth
2,409,952	Clarence A. Notman	Fountain Brush
2,409,979	Ralph L. Huber	Hypodermic Needle
D-145,824	Earl D. Stiles	Design for a Timing Indicator for Processing Dental Plastics
	October 29	
2,410,351	Marshall L. Lockhart	Hypodermic Syringe

COMMITTEE OF THE NATIONAL MUSEUM AND DENTAL REGISTRY

REGISTRY OF DENTAL AND ORAL PATHOLOGY BEGINS EXPANSION

FOLLOWING is a digest of the annual report of the Committee of the National Museum and Dental Registry which was presented at the eighty-seventh annual meeting of the House of Delegates in Miami, October 14-16, 1946:

With the ending of World War II, the Registry of Dental and Oral Pathology at the Army Institute of Pathology began a program of expansion so that dentists who were acquainted with the Registry while they were in service might become active participants. Many dentists who were regular contributors to the Registry before entering service have returned to practice and again have become active supporters.

Henry A. Goldman, former secretary and pathologist of the Registry, instituted a collection of Kodachromes, 2 by 2 inch (5.1 by 5.1 cm.), depicting the clinical and microscopic story of oral diseases. Today there are more than 1,600 slides in the collection. All are indexed, and a catalogue is available for those who wish to borrow the material. A similar catalogue of lantern slides, 3½ by 4 inch (8.9 by 10.2 cm.), was also prepared. In October 1945, Dr. Goldman was discharged from service and Lt. Col. Joseph L. Bernier, former secretary and pathologist of the Registry, was assigned as a replacement at the Army Institute of Pathology, where he is serving at the present time.

Consultants to the Registry

The Board of Consultants consists of seven outstanding dental pathologists. Reports of unusual cases referred to this Board of Consultants have reached dental schools, permitting students to see the material and read the comments of the Board.

There are more than 6,000 reports of cases on file with the Registry of Dental and Oral Pathology today. Both oral surgeons and general practitioners find specialized consultation on unusual cases valuable. Users of the service receive a histologic report on the tissue submitted.

The present loan study set is especially popular with dentists recently discharged from the armed forces, as it provides a refresher course on pathologic tissue changes. Complete study sets of microscopic slides are being prepared for two dental schools to use in undergraduate teaching. The sets will include material on lesions of the supporting structures of the teeth, tumors and diseases of the mouth.

Atlas of Dental and Oral Pathology

The third edition of the Atlas of Dental and Oral Pathology became available October 1, 1944. The fourth edition, now being prepared, will be styled as a textbook, although emphasis will continue to be placed on pictures.

Since 1941 the Registry has been furnishing clinical and microscopic photographs pertaining to oral pathology to several state boards for use in examinations.

Fellowship

Since its inception, the Registry has regarded the establishment of a fellowship at the Army Institute of Pathology as of paramount importance to insure maximum value from the material accumulated. In 1944 the American Dental Association approved its establishment. By early 1946 more than a

hundred applications had been received. The first Fellow reported for duty in March 1946, but with the calling of ASTP graduates to the army he was forced to resign in July 1946. The Registry hopes to replace the present Fellow by January 1947.

The American Registry of Pathology

The American Registry of Pathology is maintained at the Army Institute of Pathology under sponsorship of the National Research Council, Division of Medical Science. There are fifteen registries at the Institute now. A proposed reorganization of the entire Registry program under a civilian director will depend on the support of the organizations represented.

The Registry has undertaken the establishment of the American Academy of Oral Pathology. A preliminary survey indicated that a national society devoted to the presentation of oral pathology was desirable. Accordingly, a group of outstanding men were asked to serve as temporary officers, and on June 7, 1946, the first meeting of the executive committee was held in Washington, D. C., and a constitution was adopted.

The objectives of this Academy are concerned with the consolidation of endeavor and research in dental and oral pathology. It was decided that the Academy should certify competent men as Fellows of the American Academy of Oral Pathology. Twenty outstanding oral pathologists in the United States were selected as charter Fellows. Membership in the Academy, as differentiated from fellowship, is open to any person with training beyond the undergraduate level. This person may be qualified to fellowship by a qualifying board.

Recommendations

Both the specialists in oral surgery and pathology and the general dental practitioners are constantly requesting diagnostic aid and are utilizing the pathologic material provided by the Committee. The Committee therefore recommends: (1) that the present budget, $1,500 for technical assistance and $2,500 for the fellowship of dental and oral pathology, be continued, and (2) that the American Dental Association, through the museum committee, actively support the reorganization of the Registry of Pathology at the Army Institute of Pathology.—*Henry A. Swanson, Chairman.*

COMMITTEE ON MEMBERSHIP

MEMBERSHIP COMMITTEE REPORTS

INCREASE IN REGULAR MEMBERS

FOLLOWING is a digest of the annual report of the Committee on Membership which was presented at the eighty-seventh annual meeting of the House of Delegates in Miami, October 14-16, 1946:

The Membership Committee reports an increase in regular members, since October 1944, of 5,071, a decrease in junior members of 660 and no change in life members, giving a total increase in all classes of 4,411, as of June 1, 1946. Total membership is now 59,249.

Several dental schools have more members listed than students for the years 1940 through 1945; this was owing to the accelerated courses and the fact that the junior membership year starts October 1 and ends September 30. Now that the dental schools have returned to normal again in regard to the school year, it will again be possible to put into operation the provisions of the membership plan of the American Dental Association.

During the war, winners of the junior membership contest each received as a prize war bonds worth $150. The Committee hopes that in 1947 the four zone winners may attend the A.D.A. annual meeting as guests of the Association and write reports on observations of the meeting.

The Committee recommends that Chap-

ter I, Section 7, of the Administrative Bylaws be amended to read student members instead of junior members. This change will eliminate the confusion of those who think that they can transfer a junior membership card into a regular membership card without joining a district society.

Since Chapter I, Section 12, of the Bylaws of the American Dental Association was altered, making it mandatory for a person to be 65 years old and a member for twenty-five years to be eligible for life membership, a number of state and district societies are conforming to the rule. The Committee urges all societies which have not changed their life membership requirements to do so.

Life members now receive THE JOURNAL without cost on request.

More than 10,000 members paid $6 dues each in a calendar year. Of the $6, $3 was returned to the state society.

Since the completion of the motion picture "The Story of the American Dental Association" in 1945, 245 dental societies have shown the film and it has been viewed by 14,770 dentists. The Committee urges all societies which have not seen the film to write for a showing.

A system of records is being set up in the Central Office. The new membership record system will provide: (1) complete record of all dentists in the United States, (2) analysis of which nonmembers are eligible for membership, enabling direct mail solicitation of eligible nonmembers and showing the percentage of membership record of each state and local society, (3) continuous record of membership, (4) signal control revealing eligible nonmembers and delinquents and (5) the publication by the American Dental Association of a classified directory of dentists, nonmembers as well as members.

A new membership booklet entitled "The American Dental Association" has been published explaining the Association's activities. Copies have been sent to all dental schools for distribution to the students. Membership news releases are sent every other month to all state and district journals.—*Paul W. Zillmann, Chairman.*

RESEARCH COMMISSION

CONTRIBUTIONS OF RESEARCH ASSOCIATE TO THE FIELD OF BACTERIOLOGY

THE dental profession is confronted with numerous problems concerning the cause of dental diseases. Among the more important periodontal diseases is Vincent's infection. In September 1941, the Research Commission of the American Dental Association secured the services of E. G. Hampp to investigate the cause of this condition, and he has devoted full time to the investigation of the oral spirochetal flora.

Dr. Hampp began his investigations of the cause of Vincent's infection by studying the oral fusospirochetal flora because the constant predominance of these organisms in such conditions endows them with a possible etiologic significance. This evidence is further supported by the fact that under certain conditions these organisms are found to invade the soft tissues of the mouth. In order to carry out these investigations, it was necessary to obtain pure cultures of the various members of the oral fusospirochetal flora. The fusiform bacilli have been isolated, cultivated and classified with a reasonable amount of accuracy, but the various members of the spirochetal flora have presented an enigma in this respect.

Even though the oral spirochetes have been known and studied since 1883, a pure culture of the smaller oral spirochetes was not obtained until 1906. Up to the present time approximately twelve

reports have been made in the literature on the isolation of the smaller oral treponemes. These methods are extremely involved and difficult to reproduce under the best conditions. Dr. Hampp has developed a simplified method for routine isolation and pure cultivation of the smaller oral treponemes. In addition, he has been the first investigator to obtain pure cultures of Borrelia vincenti. He has obtained three pure cultures of these organisms from cases of Vincent's infection. The technic employed is not infallible but has been developed to the point where primary cultures may be obtained routinely. The difficulty has been in subculturing Bor. vincenti from primary plates.

After pure cultures of the smaller oral treponemes and Bor. vincenti were obtained, much information was gained from investigations of these pure strains. A comparative study of the oral spirochetes by darkfield and stained smear methods demonstrated the unreliability of heat-fixed stained films for the identification of the various members of the oral spirochetal flora. Such methods were shown to be responsible for obscuring morphologic details and for moderate to extreme degree of distortion of the smaller oral treponemes, as well as for pronounced shrinkage and change in shape of the oral Borrelia. These morphologic alterations were found to cause great confusion in recognizing with any degree of accuracy the form referred to as Bor. vincenti. The darkfield examination was found to be superior to the stained smear examination for depicting the fine structural details which are essential for identification and classification of the spirochetes associated with oral fusospirochetal infection. In this respect, the routine use of the darkfield apparatus as an aid in clinical diagnosis cannot be overemphasized. By this means much of the existing confusion concerning the identity of the oral spirochetes may be eliminated. These findings have been reported and called to the attention of practicing dentists and state public health organizations.

In addition, Dr. Hampp has shown by study of pure cultures of the oral spirochetes that these organisms are "granule producers." Many members of the family Spirochaetaceae are known to be "granule producers." There is much discussion in the literature concerning the possibility of these granules being a spore-like stage in the life cycle of the spirochetes and whether the granules can, under favorable conditions, reproduce vegetative forms of the organisms. It has been advocated in the literature that oral spirochetal cultures should be transferred every two to six weeks to prevent loss of cultures. However, Dr. Hampp's studies have shown that cultures of spirochetes may be kept as long as three years without subculturing and by darkfield examination they may be found to consist of nothing but granules. Subcultures of these strains produced vegetative forms in three to five days. Although it is problematic, there is a possibility that there may be some association between the "granular phase" of the oral spirochetes and the relapses so frequently observed in a certain percentage of cases treated for Vincent's infection.

Up to the present time, investigators working with various types of spirochetes have been unsuccessful in maintaining viability and pathogenicity of spirochetes that have been dried from the frozen state by the lyophile process. These findings indicate that preservation of most viruses and bacteria is unsuccessful. Such a method of preserving spirochetes is desirable to prevent the diminishing or the loss of certain strain characteristics as encountered by repeated subculture on artificial media. Dr. Hampp developed a special medium in which the spirochetes could be grown and then successfully dried from the frozen state in the same menstruum with the preservation of viability and strain characteristics.

In conjunction with the bacteriologic investigation of Vincent's infection, Dr. Hampp has obtained routine gingival biopsies from acute cases of Vincent's infection and from malaria and filariasis patients exhibiting an ulcerative type of gingivitis and stomatitis. Over three thousand serial sections were prepared from this material; alternate sections were mounted and prepared for hematoxylin and eosin stains, for silver stains (for spirochetes), for Gram's stains and for micro-incineration. Some interesting observations have been made on this material which may yield some information on the pathogenesis of Vincent's infection. In all cases from which biopsies were taken, routine smears, darkfield preparation and cultures were made.

In an attempt to determine whether the oral spirochetes were the causative agents responsible for Vincent's infection, Dr. Hampp used his various pure strains of spirochetes for animal inoculation. Various routes of inoculation were employed, intravenous, intraperineal, subcutaneous, intramuscular and intracerebral. The anterior chamber of the eyes of rabbits and developing chick embryos were also inoculated without demonstrating any pathogenicity of these organisms. Attempts were made to enhance the virulence of the spirochetes by employing gastric mucin as used for studies of the meningococci and also the Duran-Reynals phenomenon, without success.

Inasmuch as the spirochetes were found to be devoid of pathogenicity for experimental animals, it was impossible to demonstrate by this method whether or not these organisms were the causative agents responsible for Vincent's infection. The only alternative remaining was to develop serologic methods to accomplish this task. There have been no reports in the literature on serologic procedures with oral spirochetes. The agglutination test was selected as the first method of approach to the problem. It was necessary, in order to carry out this study, to grow large quantities of organisms for immunization of animals and for use as an antigen in carrying out the agglutination reaction. The usual technics for surface cultivation of bacteria for immunologic studies are not applicable to the oral spirochetes. It was necessary to develop new technics and media to carry out these investigations. A liquid medium was devised for mass cultivation of the spirochetes for intravenous inoculation of animals and another medium in which the spirochetes could be grown in sufficient numbers to be used as an antigen for agglutination tests.

Rabbits were immunized with the various strains of oral spirochetes and the organisms tested against their homologous immune serums as well as cross agglutinated. The agglutination titres of the immune serums when tested against homologous strains of spirochetes ranged between dilutions of 1:1,000 and 1:1,000,000, a finding which demonstrates that these organisms are highly antigenic. The cross agglutinations seemingly indicate that the test is specific, but absorption studies are under consideration for further substantiation of these findings.

In addition, the precipitin reaction is being studied. Dr. Hampp has demonstrated that the oral spirochetes contain a soluble polysaccharide which will give another serologic method adaptable to the oral spirochetes.

The preliminary investigations on the development of a workable agglutination and precipitin test by Dr. Hampp are a decided advance in the investigation of the oral spirochetes. In the near future he will be able to test the serums of patients with Vincent's infection for antibodies against these organisms and to determine whether or not the oral spirochetes are the causative agents responsible for this disease. In addition, by these methods the oral spirochetes can be classified on a sound serologic basis which in the past was not possible. The methods and technics which Dr. Hampp has de-

vised throughout his investigations are not only applicable to the field of oral spirochetes but can undoubtedly be adapted to the study of pathogenic spirochetes in the field of medicine. The development of bacteriologic methods for the investigation of the family Spirochaetaceae have not kept pace with the studies for other organisms in the field of bacteriology, and any new developments are valuable contributions to the whole field of spirochetal research.—*Daniel F. Lynch, Secretary; M. D. Huff, Chairman.*

BUREAU OF PUBLIC RELATIONS

DENTAL HEALTH EDUCATION

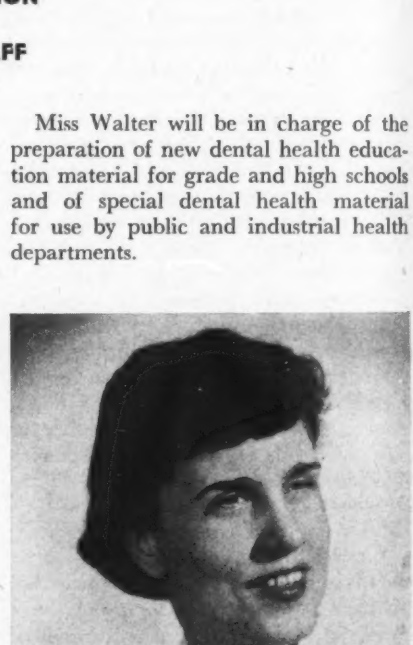
WRITER JOINS A.D.A. STAFF

APPOINTMENT of Glenna G. Walter, formerly of Philadelphia, Pa., as a writer of dental health education material for the Bureau of Public Relations of the American Dental Association, is announced by Lon W. Morrey, Bureau director.

Miss Walter received her bachelor's degree in education from the University of Pennsylvania and completed her work in public health at the University of Minnesota. She also is a graduate of the School of Nursing of St. John's Hospital at Springfield, Ill. She has taken postgraduate courses at the St. Louis Isolation Hospital, the University of Pennsylvania and the Long Island College of Graduate Medicine, Brooklyn, N. Y.

Prior to joining the A.D.A. staff, Miss Walter was an industrial nursing consultant for the Employers' Mutual Liability Insurance Company, at Philadelphia. Previously she served as an advisory nurse and specialist in venereal disease control in the Wisconsin State Department of Health, at Madison, and as a supervising nurse at the Radium Institute, Green Bay, Wis. She also did general duty nursing at St. John's Hospital and at St. John's Sanitarium, Riverton, Ill.

Miss Walter will be in charge of the preparation of new dental health education material for grade and high schools and of special dental health material for use by public and industrial health departments.



Glenna G. Walter, newly appointed dental health education writer for the Bureau of Public Relations

COUNCIL ON DENTAL EDUCATION

GRADUATES OF DENTAL SCHOOLS FOR THE YEAR ENDING JUNE 30, 1946

THE Council on Dental Education compiles statistics on graduates of the dental schools in the United States for each academic year ending June 30. The accompanying tables show that the total number of graduates for the year ending June 30, 1946, was 2,666. Many of these graduates were enrolled under

Table 1.—Number of dental students graduating each month during the year ending June 30, 1946

School	1945						1946						Total
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	
P & S	40					1							41
California				39				6				25	70
So. California						41						4	45
Georgetown									51				51
Howard			26									38	64
Emory									86				86
Loyola, Chicago			51									55	106
Northwestern			56							1		82	139
Illinois			33			16			1			40	90
Indiana		36		—								38	74
Iowa									21			1	22
Louisville									45				45
Loyola, N. O.			34								53		87
Maryland				6					60				66
Harvard													
Tufts									75				75
Detroit												40	40
Michigan												40	40
Minnesota		85				7						62	154
Kansas City												79	79
St. Louis								96					96
Washington			39									40	79
Creighton									21				21
Nebraska			27										27
Columbia									42			1	43
New York										117		1	118
Buffalo			2									53	55
Ohio		9							58			2	69
W. Reserve									44				44
Oregon								50					50
Temple								71				6	77
Pennsylvania									71			18	89
Pittsburgh			75									73	148
Meharry			27									21	48
Tennessee						18						18	36
Baylor		60										45	105
Texas			50									38	88
Virginia									31				31
Marquette		4	2						61	1			68
Total	40	194	422	45		83		223	667	119	53	820	2,666

the accelerated plan of administration. It will be observed in Table 1 that there are some graduates for this academic year in every month except November and January. Table 2 indicates that 1,315 of these graduates entered upon dental study with two years of liberal arts education, 552 with three years, 102 with four years without a degree and 697 with a bachelor's or other degree.

The peak of the number of graduates under the accelerated plan was reached in 1945 when there were 3,212 graduates. The average number of graduates for the five years prior to the establishment of the accelerated plan was 1,712.

Table 2.—Predental college training of graduates of dental schools for the year ending June 30, 1946

School	Predental College Training					Total	Percentage with Degree	Number Graduating in Combined Courses
	Two Years	Three Years	Four Years Without Degree	Bachelor's Degree	Other Degree			
P & S	25	6	5	5	.....	41	12	13
California	39	10	.....	19	2	70	30	67
S. California	28	4	.....	13	.....	45	29	8
Georgetown	29	10	4	8	.....	51	16	.....
Howard	8	18	1	37	.....	64	58	.....
Emory	51	11	4	20	.....	86	23	.....
Loyola, Chicago	58	28	3	15	2	106	16	.....
Northwestern	81	22	3	32	1	139	24	.....
Illinois	35	27	8	19	1	90	22	42
Indiana	35	24	3	11	1	74	16	11
Iowa	10	9	.....	3	.....	22	14	4
Louisville	9	13	8	15	.....	45	33	.....
Loyola, N. O.	40	17	2	27	1	87	32	.....
Maryland	32	7	.....	27	.....	66	41	.....
Harvard	.....	.....	.....	.....	.....	.....	.....	.....
Tufts	47	7	.....	19	2	75	28	.....
Detroit	24	8	1	7	.....	40	18	1
Michigan	19	11	2	5	3	40	20	4
Minnesota	122	21	.....	9	2	154	7	11
Kansas City	47	9	3	20	.....	79	25	.....
St. Louis	33	30	12	21	.....	96	22	.....
Washington	39	18	2	19	1	79	25	1
Creighton	18	3	.....	.....	.....	21	0	10
Nebraska	15	10	.....	2	.....	27	7	19
Columbia	2	12	1	26	2	43	65	3
New York	15	40	7	48	8	118	47	17
Buffalo	36	14	1	4	.....	55	7	.....
Ohio	41	19	.....	7	2	69	13	.....
Western Reserve	28	5	4	6	1	44	16	21
Oregon	29	10	1	10	.....	50	20	.....
Temple	31	8	5	32	1	77	43	.....
Pennsylvania	38	21	4	26	.....	89	29	.....
Pittsburgh	81	27	3	36	1	148	25	13
Meharry	5	11	.....	32	.....	48	67	.....
Tennessee	17	6	1	12	.....	36	33	2
Baylor	52	20	5	26	2	105	27	12
Texas	49	12	8	18	1	88	22	.....
Virginia	5	11	1	14	.....	31	45	3
Marquette	42	13	.....	12	1	68	19	2
Total	1,315	552	102	662	35	2,666	26	264

CURRENT LITERATURE

Some Opinion Research Principles Developed Through Studies of Social Medicine. Stanley Payne. Pub. Opinion Quart. 10:93, Spring 1946.

The conflicting conclusions drawn from two national studies of public attitudes on health legislation have resulted in extensive confusion concerning the value of public opinion polls. A recent report provides an explanation of the apparent discrepancies and presents several important conclusions for the edification of persons who have been aroused by demands for compulsory health insurance.

Opinion Research Corporation, in its 1943 survey, reported: "Only 16 per cent of American people approve of a 6 per cent payroll deduction from wages, for the Federal government to provide medical care and hospitalization." In contrast, the National Opinion Research Center, in its 1944 survey, found that "68 per cent think it would be a good idea for social security to cover doctor and hospital care." Mr. Payne reports that contradictions of these findings are more apparent than real. The 16 per cent refers to persons who would favor government medicine, however expensive the employee participation, and the 68 per cent includes subscribers to the plan in all degrees; for, as further reported by NORC, actually only 18 per cent of this group were classified as uncompromising advocates of public medicine.

ORC, with the former discrepancy in mind, polled the general public, experimenting with various polling technics, and found public opinion uncrystallized on plans for medical insurance. Although an easier method of medical payment is desired, there is great diversity as to which specific means is best.

It was learned further that people frequently give answers about ends (establishment of an easier method of paying medical bills) when the question deals with the means (the most superior method) of accomplishing the end. The 68 per cent response was in reality a vote for any plan, governmental or otherwise. Thirty-one per cent of this total group approved as the best method the amendment of the federal social security law. As this percentage so closely coincides with the 32 per cent of the original ORC respondents, favoring the increase of social security tax for medical insurance, the findings of the two research agencies are reconcilable.

It appears, therefore, that the public attitude concerning the issue of social medicine can be summarized in the following four points:

1. A great majority of the public thinks that an easier method of paying for medical care is a desirable goal.

2. The public understands broadly the various means to attain that end.

3. There are widespread differences of opinion as to which specific means is best. Even more important, the same person will change his mind concerning the method he would favor, depending upon the alternatives presented, the emotional "set" of the phraseology used in presenting various means, and even upon the order in which the alternative methods are presented. Thus opinion on means is still highly uncrystallized.

4. People frequently give answers about ends when the question deals with means to ends.—*J. E. Bagdonas.*

The Closure of Oromaxillary Fistulae: A Preliminary Report. Proctor Bruce. Laryngoscope 56:46, February 1946.

An unspecified number of oromaxillary fistulæ occurring after dental extractions were corrected by inserting cone-shaped plugs of preserved rib cartilage into the alveolus. The base of the cone was trimmed flush with the alveolar crest, and a mucous membrane flap over the area was said to be unnecessary. Associated suppuration of the maxillary sinus was treated by irrigations through the nasal ostium.

If sinus suppuration persisted, a Caldwell-Luc operation or intra-nasal antrostomy was performed after the cartilage implant had healed in place. For treatment of long-standing fistulæ complicated by the presence of polypoid degeneration and hyperplasia of the antral mucosa, a Caldwell-Luc operation was performed. The entire diseased mucosa was removed, and an antral window into the inferior meatus was established. After the instillation of 5 gm. of sulfathiazole into the sinus, the alveolar plug was placed. Hemorrhage was

controlled by the injection of pitressin, and packing of the nose or sinus was considered ill-advised.—*D. B. M.*

Blood Levels of Penicillin After Various Forms of Oral Administration. L. D. Seager, W. G. Shoemaker and G. Wells. Am. J. M. Sc. 212:90, July 1946.

Penicillin was given orally in combination with a number of vehicles. When given on an empty stomach in tap water, blood levels and urinary excretions were found to be considerably greater than when the drug was given after a meal. Penicillin solutions in saponified lanolin and sesame oil enhanced and prolonged blood levels and increased urinary excretion of the drug as compared with controls with tap water. The use of an enteric coating in addition to a suspending medium more than doubled the efficiency of absorption of penicillin as compared with a suspending medium alone. The use of aluminum hydroxide along with penicillin gave blood levels less than those obtained with an enteric coating. No confirmation was found of the prolonged blood levels of penicillin reported for its use after absorption by aluminum hydroxide gel.—*R. C. L.*

Changes Occurring in Bacillus Fusiformis During the Application of Penicillin. J. F. Webster and Hilde Frey. Nature 158:59, July 13, 1946.

In 41 of 210 clinical cases of ulcerative stomatitis treated with penicillin, a peculiar change in shape was noticed in the fusiform bacilli. Central round or spindle-shaped swellings of intensively stained material were found in varying numbers. These bodies were never observed in untreated cases or after any other treatment of this condition.—*J. E. Gilda.*

Trichlorethylene and Dental Analgesia. E. A. Scher. D. Rec. 66:213, September 1946.

The physical, chemical and pathologic properties of trichlorethylene are briefly described. Analgesia is defined in detail and advantages of trichlorethylene and its contraindications are mentioned. Details and specific applications of two methods of administration are given. Observations of 521 cases indicate that on the whole the results were uniformly satisfactory. One of the principal disadvantages was the fact that 9 per cent of the cases were analgesia resistant. Excessive salivation and certain other side reactions were encountered in a small percentage of the cases. The author concludes that trichlorethylene can be used safely for analgesia with the apparatus devised and that it has a definite field of usefulness in dental practice, especially as a supplement to, or substitute for, local anesthesia.—*R. Likins.*

Mineral Metabolism in the Dental Hard Tissues. H. Berggren. Acta Radiologica 27:248, Fasc. 3-4, 1946.

A number of experiments are described in which autoradiographs were made. Teeth of animals injected previously with radioactive P or Na were cut into ¼ mm. sections and placed on Blan Rapid (Agfa) and Eastman Spectroscopic plates. The latter seemed to give better results.

Radioactive isotopes were injected into seven dogs (P^{32} in five; Na^{24} in two) some of whose teeth had previously been crowned or placed under the rubber dam. The dogs were sacrificed after two and one-half to four hours and the teeth were removed. Enamel was separated completely from dentin by heating the teeth to 400-500° C., after which they were carefully dissected by hand. The enamel of teeth isolated from saliva showed a distinct activity which was 10 to 12 per cent of that in enamel of unisolated teeth. Similar studies made on human beings demonstrated that enamel of isolated teeth took up one-tenth to one-half the quantity found in unisolated enamel. In one case several teeth were isolated under the rubber dam and Na_2HPO_4 containing P^{32} was placed in contact with the isolated crowns. Teeth were extracted after two to four hours. Phosphorus had penetrated the enamel, for distinct activity was established in both root and crown dentin, the activity in the latter being about twice as great as that in the former.—*J. E. Gilda.*

Infections and Reflex Disorders of the Eye from Dental Affections. D. Kravitz. Am. J. Ophthalmol. 29:1135, September 1946.

After reviewing a comprehensive list of publications dealing with this subject and, more generally, the subject of focal infections, the author states that "It is, therefore, apparent that every form of ocular disorder has been ascribed as secondary to infections of the teeth."

Seventeen case histories were reported in which a clinical relationship appeared to exist between a variety of ocular symptoms and dental infection. It was suggested that the ophthalmologist should consult with a dental surgeon concerning such cases. Radical dental surgery such as removal of many teeth within a short period of time is considered ill-advised, in view of the possibility of producing a violent reaction in the afflicted eye. When a focus of dental infection appears to be a likely contributor to eye disorders, those teeth with definite periapical infection should be removed. However, indiscriminate dental surgery is contraindicated. The bibliography will prove of value to investigators in this field.—*D. F. Mitchell.*

The Family and Dental Diseases. II. Age of Parents and Dental Caries (DMF) Experience in Offspring. Henry Klein. Am. J. Orthodont. 32:530, July 1946.

Analyses of findings from dental examinations of more than 1,500 children and their parents were made in an attempt to determine whether or not children of older parents tend to have a different susceptibility to dental caries than children born of younger parents. All the children were born in the Southern California area, of parents born in Japan. At the time of examination these children had been relocated with their parents to the Colorado River Relocation Center at Poston, Ariz. A study of the data reveals that the age of neither parent at the time of birth of their offspring has any consistent relationship to the amount of dental decay experienced by the offspring. The differences, where they exist, are small and not consistently related to the age of either parent.—*S. W. Leung.*

The Family and Dental Disease. III. Size of Family and Dental Caries (DMF) Experience in Offspring. Henry Klein. Am. J. Orthodont. 32:533, July 1946.

Analyses of data obtained from dental examinations of more than 1,700 children of Japanese ancestry residing at the Colorado River Relocation Center at Poston, Ariz., with respect to the size of the family and the caries experience, show no relationship between the size of family and the amount of caries experienced by the offspring. At the same age, on the average, the child of the small family (one to three children) shows about the same amount of dental caries experience as the child of a large family (six or more children).—*S. W. Leung.*

Expulsion of Pathogenic Organisms from the Respiratory Tract. J. P. Duguid. Brit. Med. J. 1:265, February 23, 1946.

Droplets containing hemolytic streptococci were expelled during a series of six coughs by 39 of 87 scarlet fever patients and carriers; 1,109 infected droplets were expelled during 522 coughs. Hemolytic streptococci, usually in small numbers, were found in the anterior mouth secretions of 13 of 87 patients.

Droplets containing diphtheria bacilli were expelled during a series of six coughs by 10 of 50 patients with faucial diphtheria; 48 infected droplets were expelled during 300 coughs. Diphtheria bacilli, usually in very small numbers, were found in the anterior mouth secretions of 12 of the 50 patients.

Droplets containing tubercle bacilli were expelled during a series of six coughs by 10 of 20 patients with open pulmonary tuberculosis. Of 410 droplets collected during 120 coughs, 36 were found to contain tubercle bacilli in numbers varying from 1 to 40,000. Tubercle bacilli were found in the throat secretions of 15 of the 20 patients before coughing was permitted and in the anterior mouth secretions of 10 of the 20 patients.—*J. E. Gilda.*

Hemorrhagic Vesicles and Bullae of the Mucous Membranes of U. S. and British War Prisoners in Japan Subsiding on a Deficient Diet. W. T. Foley. New York State J. Med. 46:2300, October 1946.

A condition of hemorrhagic vesicles and bullae of the mucous membranes was observed in allied war prisoners, subsisting on a diet deficient in all the known vitamins, protein and fat. The condition did not respond to the administration of vitamins A, C and D, thiamine chloride, nicotinic acid, riboflavin or yeast. It cleared up completely at the end of the war, when the men were placed on a diet rich in vitamins, protein and fat. The author feels that this condition was the result of some substance in the diet acting over a long period of time. The men were on the deficient diet for eight months before the condition appeared. The symptoms of the classic vitamin deficiency diseases had long since been manifest.—*E. R. Costich.*

DEATHS

Oglesbee, Charles S., Xenia, Ohio; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1883; died October 19; aged 89.

Perrin, Alfred R., Bernardsville, N. J.; The New York College of Dentistry, 1897; died November 9; aged 73.

Reigle, Reiff J., Harrisburg, Pa.; Dental Department, Baltimore Medical College, 1911; died September 25; aged 56.

Rhoades, Jesse H., Newton, Kan.; Western Dental College, 1898; died September 14; aged 73.

Roach, Lyman D., Shreveport, La.; College of Medicine, School of Dentistry, Tulane University of Louisiana, 1911; died October 28; aged 64.

Saunders, R. H., Montezuma, Ga.; Atlanta Dental College, 1905; died October 21; aged 60.

Sawyer, F. L., Bethany, Mo.; Dental School, Northwestern University, 1905; died October 13; aged 65.

Seaquist, William P., Mankato, Minn.; College of Dentistry, University of Minnesota, 1902; died October 18; aged 77.

Searles, Wallace B., Ossining, N. Y.; The Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1916; died November 3; aged 54.

Shraeder, Lee B., Jay, Okla.; died August 11; aged 57.

Shuman, Harry B., Jamaica Plain, Mass.; Dental School, Harvard University, 1902; died November 1; aged 67.

Sloate, Abraham H., Los Angeles; died September 13; aged 52.

Smith, George H., Medina, Ohio; died September 10; aged 64.

Spaulding, John A., Moravia, N. Y.; School of Dentistry, University of Louisville, 1892; died October 9; aged 76.

Spindler, Alvah L., Watseka, Ill.; died October 7; aged 69.

Spitler, Grove L., Roanoke, Va.; School of Dentistry, Medical College of Virginia, 1917; died October 27; aged 52.

Springsted, James W., Port Washington, N. Y.; New York College of Dentistry, 1900; died September 17; aged 75.

Steinmetz, George E., Waterbury, Conn.; died October 19.

Sumerlin, L. L., Ashland, Ore.; died October 22.

Svoboda, George W., St. Louis, Mo.; School of Dentistry, St. Louis University, 1916; died in October; aged 51.

Swan, James S., Erie, Pa.; died November 1; aged 55.

Tellone, Emil E., Newark, N. J.; Dental School, Harvard University, 1920; died November 5.

Tessmer, John A., Holden, Mass.; died September 29; aged 61.

Tunnicliff, Ruth, Chicago; died September 22; aged 70.

Tuttle, Frank C., Camden, N. J.; died September 18.

Underwood, Richard G., Northeast, Md.; died September 6; aged 86.

Van Nostrand, William S., Merrill, Wis.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1891; died October 16; aged 80.

Volk, Robert W., Pittsfield, Mass.; The Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1891; died October 26; aged 79.

Vyn, Arend, Grand Haven, Mich.; College of Dental Surgery, University of Michigan, 1907; died August 19; aged 60.

Waldron, Frederick V., Slippery Rock, Pa.; died October 7.

Warner, Brinton L., Panama Canal Zone; Baltimore College of Dental Surgery, 1908; aged 61.

Webre, Joseph L., New Orleans, La.; died September 12; aged 71.

West, Edward C., Tiffin, Ohio; died September 8; aged 69.

Williams, Percy M., Rutland, Vt.; The Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1916; died November 4; aged 76.

Wilson, Charles E., San Leandro, Calif.; died August 24; aged 77.

Windwehen, C. V., New Braunfels, Texas; College of Medicine, School of Dentistry, Tulane University of Louisiana, 1903; died July 23; aged 66.

Wisely, Harry P., Richmond Hill, N. Y.; School of Dentistry, Temple University, 1894; died September 29; aged 73.

Wollenberger, S., Chicago; College of Dentistry, University of Illinois, 1901; died July 8; aged 71.

Wood, John H., Hockley, Texas; Ohio College of Dental Surgery, University of Cincinnati, 1910; died September 10; aged 64.

Yount, George B., San Francisco; School of Dentistry, College of Physicians and Surgeons of San Francisco, 1904; died August 22; aged 64.

LIST OF DENTAL OFFICERS

SEPARATED FROM ARMY DENTAL CORPS

THE following list of dental officers separated from the Army Dental Corps does not include rank because such information is no longer furnished by the Surgeon General's Office. Publication will be given to other names as soon as possible.

Alabama

Birmingham	Massey, David L., Jr.
Tuscaloosa	Wilson, Houston, Jr.

Arizona

Safford	Gungle, Edward J.

California

Altadena	Valentine, John J.
Burbank	Gunter, Stephen G.
Fresno	Kandarian, John
Glendura	Easley, Burton L.
Hollywood	Miller, John D.
Huntington	Peterson, Wayne L.
Long Beach	Donaldson, Earl D.
Long Beach	Faris, John W., Jr.
Los Angeles	Cutler, Harry
Los Angeles	Emmett, Robert R.
Los Angeles	Harradine, George R.
Los Angeles	Harrison, Clifford D.
Los Angeles	O'Neil, Hobart M.
Los Angeles	Ryan, Norus A.
Los Angeles	Schonfield, Louis H.
Los Angeles	Witty, Henry V.
Oakland	Stannard, Walter D.
Redlands	Hardy, Richard C.
Sacramento	Harada, Yoshizo
Sacramento	Pinion, Ralph D.
San Francisco	Alkalay, Leopold N.
San Francisco	McDowell, James A.
Winters	Merchant, George E., Jr.

Colorado

Amache	Okuda, Masato
Denver	Newlin, Calvin C.
Greeley	Patterson, Chauncey W.
Pueblo	Potter, Gordon J.
Pueblo	Seelye, Stuart E.

Connecticut

Bridgeport	Casillo, Leonard P.
Bridgeport	Levin, Philip A.
Hartford	Mellion, Gilbert L.
Middletown	Kaufman, Joseph R.
West Hartford	Nirenstein, Jack B.
West Haven	Serow, Nathan N.

Florida

Bee Ridge	Harris, William S., Jr.
St. Petersburg	Pearson, James L.

Georgia

Adel	Shaw, Fay A.
Forsyth	Chapman, Oscar H., Jr.

Illinois

Beardstown	Charles, Thomas R.
Belleville	Nesbit, Francis W.
Chicago	Czelslawski, Thaddeus A.
Chicago	Elman, Earl S.
Chicago	Gasior, Thaddeus B.
Chicago	Heydanek, Edwin J.
Chicago	Jaeger, Eugene H.
Chicago	Kowalski, Leonard F.
Chicago	McCormick, John F.
Chicago	Machek, Frank A.
Chicago	Meis, William A.
Chicago	Nechtow, Daniel J.
Chicago	Onak, William E.
Chicago	Parowski, Stanley J.
Chicago	Patti, Angelo R.
Chicago	Prusis, Algerd W.
Chicago	Purcell, John F.
Chicago	Smith, LeRoy A.
Chicago	Thomas, Edward C.
Chicago	Treiber, Marven
Elgin	Sides, Stanley J.
Evanston	Meinig, George E.
Lincoln	Ogle, Francis C.
Moline	Rueter, Donald H.
Nashville	Reinhart, Edgar H.
Oak Park	Carstens, Harry R.
Oregon	Wade, Harry F.
Peoria	Blue, Raymond M.
Peoria	Peters, Anthony L.
Rockford	Sowle, William H.
Springfield	Parcell, William A.

Indiana

Indianapolis	Folkening, Irving F.
Indianapolis	Goodman, George J.
Kokomo	Michener, Richard S.
Orleans	Carnes, James E.

Iowa

Burlington	Schach, Edward J.
Davenport	Brann, Clinton T.
Davenport	Townsend, George M.
Des Moines	Pinkerton, John P., Jr.
Orange City	Osdoba, Samuel
Webster City	Zeiger, Wayne L.
Woodbine	Swain, Royce C.

Kansas

Edna	Hazlett, Howard H.
El Dorado	Snyder, Russell B.
Girard	Mays, Joseph C.
Hillsboro	Schroeder, Elmer K.

Kentucky

Albany	Robinson, Daniel B.
Buckhorn	Kirby, Rice J.

Covington	Schilling, Clarence C.
Lexington	Dressler, Charles
Middlesboro	Newman, Nathan

Louisiana

New Orleans	Ellis, David J.
Shreveport	Pierpont, William G.

Maryland

Crownsville	Deneroff, Paul

Massachusetts

Brookline	Burston, Bernhardt B.
Brookline	Green, Leonard B.
East Gloucester	Powers, Walter J.
Everett	Camelio, Albert H.
Lawrence	Quellette, Raymond T.
Lowell	Lightman, Percy
Lowell	Tefft, Thomas J. N.
Newtonville	Miner, Richard L.
Northampton	Foley, Cornelius B.
North Plymouth	Keller, Israel H.
Orleans	Raddin, Reginald F.
Roxbury	Mogul, Louis
West Medford	Dinsmore, Howard S.

Michigan

Dearborn	Kopicko, Henry F.
Detroit	Berris, Gerson I.
Detroit	Besterman, Albert W.
Detroit	Liefer, Morris J.
Detroit	Lynn, Bernard D.
Detroit	McConnell, Mervin M.
Detroit	Merian, Charles G.
Detroit	Nivison, David J.
Detroit	Noonan, Melvin A.
Detroit	Pierce, Edward G.
Detroit	Roman, Leo
Detroit	Seth, Charles M.
Detroit	Szuba, Anthony S.
Flint	Caplan, David S.
Vernon	Imerman, Irvin M.

Minnesota

Blooming Prairie	Betlach, Bernard D.
Brandon	Norden, LaVerne S.
Duluth	Finkelstein, David
Hopkins	Malerich, Alexander H., Jr.
Minneapolis	Carlson, Harold F.
Minneapolis	Cutlan, Lawrence G.
Minneapolis	Larson, Mauritz O.
Minneapolis	Nelson, Earle W.
Minneapolis	Ohnstad, Terrell R.
St. Paul	Bradley, Maitland
St. Paul	Kanun, Saul S.
St. Paul	Robertson, Lyle C.
St. Paul	Singher, Ralph A.
Sleepy Eye	Romberg, Willard E.

Mississippi

Gulfport	Price, Andrew J., Jr.
Hollandale	Manning, Jasper T., Jr.

Missouri

Carthage	Ralston, Oren A.
Columbia	Smith, James I.
Festus	Lea, Richard S.
Kansas City	Hill, Paul M.
Kansas City	Sherman, Bernard
Marshall	Thomas, Efton W.
Moberly	McLellan, James M.
Perryville	Loberg, Sherman T.
St. Louis	Beck, Roy W.
St. Louis	Emling, Arno H.
St. Louis	Rau, Paul
St. Louis	Wolf, Edgar G.
Springfield	Mills, George I.
Webster Groves	Brandhorst, William S.
Webster Groves	Marvin, Ennis H.

Montana

Butte	Richards, Phillip T.
Grant	Barrett, Patrick D.

Nebraska

Franklin	Flood, Horace J.
Holdrege	Gustin, Henry M.
Lincoln	Downs, William M.
Lincoln	Krieger, Harold F.
Lincoln	Schneider, Louis L.
Omaha	McVaney, Raymond J.
Omaha	Roitstein, Morris E.
Schuyler	Tomes, Rudolph R.
Sidney	Schlumberger, Carl G.

Nevada

Winnemucca	Kominos, John A.

New Hampshire

Concord	Besse, Harlan F.
Littleton	Pion, Lawrence A.

New Jersey

Bayonne	Dubowsky, Aaron A.
Beverly	Fidanza, Joseph E.
Bloomfield	Eadie, Hugh W.
Bloomfield	Kwiecien, Walter H.
Bloomfield	Poole, Rodger E.
Bridgeton	Shapiro, William B.
Collingswood	Rokosz, John J.
Elizabeth	Lane, Hubert W.
Elizabeth	Liddy, Martin A.
Haledon	Glatt, Louis
Hoboken	Pflug, David L.
Irvington	Schnoll, Edward
Jersey City	Canter, Albert W.
Jersey City	Crosby, James W.
Jersey City	D'Elia, Vincent G.
Jersey City	Miller, Julius
Jersey City	O'Reilly, John P.
Jersey City	Welitoff, Bernard
Lakewood	Filler, Edward
Linden	Watter, Bernard
Maywood	Phillips, Harry
Morristown	Pagano, Lewis M.
Newark	DiPiazza, James J.
Newark	Hakucha, Michael
Newark	Levy, Meyer L.
Newark	Pecoraro, Arthur A.
Newark	Procaccini, Arthur J.
Newark	Robinson, Milton L.
Newark	Sachs, Jerome J.
Passaic	Rubenstein, Nathan
Red Bank	Greenberg, Jesse J.
Roselle	Levine, Arnold J.
Rumson	Mellaci, Louis F.
Trenton	Giordano, John J.
Trenton	Litowitz, Robert

Trenton	Rednor, Albert L.
Westfield	Lewis, Ralph E.

New Mexico

Albuquerque	Blueher, William A.

New York

Astoria	Havlena, William
Batavia	Stickney, Donald F.
Bath	Mesigh, Lee R.
Belfast	Kargen, Alfred
Binghamton	Zeldow, Leonard L.
Brewster	Smith, Charles H.
Bronx	Guarisco, Joseph A.
Bronx	Jaffee, Edward M.
Bronx	Klein, Leo
Bronx	Kliger, Martin
Bronx	Krumholz, Victor
Bronx	Lieberman, Lawrence
Bronx	Schulze, Raymond F.
Bronx	Sheppard, Abner L.
Bronx	Silverberg, Harold
Bronx	Simon, Norman T.
Bronx	Tenzer, Irving A.
Bronx	Wald, Alfred
Bronx	Woocher, Howard
Brooklyn	Amsterdam, David
Brooklyn	Bindler, Abraham H.
Brooklyn	Caliendo, Joseph L.
Brooklyn	DeBellis, Leonard N.
Brooklyn	Dulberg, Sidney M.
Brooklyn	Eisler, Robert
Brooklyn	Elkins, Edmund J.
Brooklyn	Feigenbaum, Irving
Brooklyn	Ferdon, Franklin M.
Brooklyn	Fisher, Morton A.
Brooklyn	Geronemus, Saul A.
Brooklyn	Greenberg, Alfred L.
Brooklyn	Greene, Louis L.
Brooklyn	Horowitz, Isidor
Brooklyn	Joondeph, Norman H.
Brooklyn	Kalman, Michael I.
Brooklyn	Kayne, Seymour S.
Brooklyn	Kritzer, Leo
Brooklyn	Kurszwil, Edward
Brooklyn	Manning, Patrick J.
Brooklyn	Marcus, Leo
Brooklyn	Marlens, William S.
Brooklyn	Mastrosimone, Michael
Brooklyn	Mauro, Anthony F.
Brooklyn	Metrick, Bernard E.
Brooklyn	Migdalof, Samuel
Brooklyn	Milner, Eugene J.
Brooklyn	Montuori, Arthur F.
Brooklyn	Morrow, Alfred L.
Brooklyn	Newman, George
Brooklyn	Reid, Harold F.
Brooklyn	Rodier, Louis J.
Brooklyn	Rosenfeld, Irving
Brooklyn	Roth, Sidney L.
Brooklyn	Rothstein, Milton
Brooklyn	Rubin, Joseph
Brooklyn	Rubin, William
Brooklyn	Salman, Samuel L.
Brooklyn	Scheuer, Bernard I.
Brooklyn	Schuster, Frank
Brooklyn	Singer, Paul
Brooklyn	Sloan, Harold J.
Brooklyn	Stein, Sam
Brooklyn	Underwood, Charles M.
Brooklyn	Wasserman, Edwin H.
Brooklyn	Weinstein, Harold
Brooklyn	Weiss, Philip
Brooklyn	Wolfe, Henry B.
Brooklyn	Zarin, Norman
Brooklyn	Zaves, Henry R.
Buffalo	Dzimian, Florian J.
Buffalo	McClure, Guilford O.
Buffalo	Skonieczny, Charles E.
Buffalo	Stone, Francis J.
Canastota	Ferrara, Louis B.
Chili	Craw, Harold J.
Fillmore	Wiles, Elon C.
Glendale	Schwartz, Jules H.
Jackson Heights	Brignole, Louis F.
Jackson Heights	Klein, Benjamin A.
Jackson Heights	Sweeny, Thomas F.
Jamaica	Everett, Donald G.
Jamaica	Green, George W.
Jamaica	O'Shaugnessey, William J.
Jamaica	Scannell, John M., Jr.
Lancaster	Monin, Raymond A.
Laurelton	Varteressian, Levon A.
Long Island	Gordon, Barney
Lynbrook	Levy, William L.
Malone	Cohen, Bernard L.
Manhasset	Bickel, William C.
Manhasset	Morris, Timothy J.
Manhasset	Posteraro, Anthony F.
New York	Alpert, Arthur H.
New York	Basse, Joseph B.
New York	Beldegreen, Raymond T.
New York	Bernstein, Morris
New York	Brooks, Robert S.
New York	Carroccio, Charles S.
New York	Cohen, Edward
New York	Cook, Robert L.
New York	Deutscher, Herbert
New York	Dobrow, Benjamin
New York	Durrer, Gustav T.
New York	Eckley, Donald W.
New York	Eckman, Irving I.
New York	Felner, Herbert M.
New York	Fingeroth, Morris M.
New York	Fink, Henry W.
New York	Friedman, Jack
New York	Friedman, Joseph L.
New York	Goldstein, Gustave
New York	Greenberg, Robert A.
New York	Grossman, Marvin M.
New York	Hansis, Edward S.
New York	Howitt, Nathan G.
New York	Jameson, Henry B.
New York	Kahn, Jacob A.
New York	Katz, Theodore
New York	Keller, Joseph G.
New York	Leder, Arthur S.
New York	Levin, Robert
New York	Lichtenstein, Lawrence
New York	Medaglia, Joseph M.
New York	Meyer, Solomon
New York	Miller, George S.
New York	Morse, Arthur M.
New York	Pelosi, Andrew A.
New York	Rabinowitz, Herbert
New York	Rappaport, Sydney C.
New York	Reiser, Samuel

New York	Ringler, Milton E.	Port Chester	Cervasio, Thomas E.
New York	Rippe, Murray L.	Poughkeepsie	Miller, Leonard J.
New York	Roberts, Louis	Poughkeepsie	Rinaldi, Nicholas J.
New York	Rosen, Seymour D.	Queens Village	DePersia, Anthony J.
New York	Rosenhack, Morris A.	Richmond Hill	Stanton, Gilbert
New York	Rosenthal, Meyer R.	Rochester	Schwartz, Nathan D.
New York	Satine, Bernard A.	Rochester	Wiesner, Milton G.
New York	Schneider, Louis	Rochester	Young, Robert W.
New York	Schulberg, Jacob	Rockville Center	Lempert, Mortimer J.
New York	Schuman, Jack A.	Saugerties	Ball, Rodney
New York	Schwartz, Gilbert W.	Schenectady	Kruger, Ralph E.
New York	Seidman, Louis S.	Snyder	Engelhardt, Peter J.
New York	Seslowe, Nathan	Staten Island	Ciardiello, Joseph A.
New York	Sholod, Morris L.	Staten Island	Cohn, Samuel
New York	Siegel, Nathan	Staten Island	Diem, Cornelius
New York	Siegel, Stanley S.	Staten Island	Goretsky, John
New York	Silver, David A.	Staten Island	Radin, Frank
New York	Solomon, Myron G.	Staten Island	Weiss, David E.
New York	Stafford, Gerald E.	Tonawanda	Warner, Elwyn C.
New York	Stein, Abraham H.	Utica	Block, Alfred
New York	Stein, Bernard H.	Watertown	Krupkin, William
New York	Stoller, Samuel	Westhampton Beach	Levin, Aaron J.
New York	Targum, Mortimer	White Plains	Liebman, Charles
New York	Taub, Meyer	White Plains	Thompson, Robert R.
New York	Trattner, George G.	Whitestone	Hurewitz, Sidney
New York	Urbano, Armand P.	Woodside	Crisafi, Pedro
New York	Wellward, Robert R.	Woodside	Sackett, Sidney A.
New York	Werdenschlag, Saul E.	Woodside	Sullivan, Joseph C.
New York	Wishengrad, Max	Yonkers	Collins, Arthur J.
Ossining	Myers, Jesse		

LIST OF DENTAL OFFICERS

SEPARATED FROM NAVY DENTAL CORPS

The following naval dental officers have been separated from service, according to lists received from the Navy Department. These lists are not complete. Other names will be pubished as soon as possible.

Alabama		
Luverne	King, William G.	Lieut.
California		
Arcadia	Stackable, Don T.	Lieut.
Arcata	Hunt, Vernon E.	Lieut.
Fresno	Beck, Mads S., Jr.	Lieut.
Fresno	Cruz, Raul L.	Lieut.
Huntington Park	Mocciaro, Pierino N.	Lieut.
Los Angeles	Davies, Stanton W.	Lieut.
Los Angeles	Gilliland, Jones A.	Lieut.
Los Angeles	Scott, Park C.	Lieut.
Los Banos	Miano, Melvin L.	Lieut.
Sacramento	Rodda, Gordon F.	Lieut.
San Francisco	Scott, J. Vernon	Lieut.
Connecticut		
New Britain	Richman, George Y.	Lieut.
Torrington	Attmore, Warren G.	Lieut.
Woodmont	Loomer, G. M.	Lt. Cmdr.
Florida		
Blountstown	Atkins, Louis J.	Lieut.
Illinois		
Chicago	Lipinski, Roman J.	Lieut.
East Moline	Diggs, David V.	Lieut.
Kewanee	Kazubowski, Edw. J.	Lieut.
Lansing	Bierma, Warren G.	Lieut.
Indiana		
Hammond	Whitney, Richard B.	Lieut.
LaGrange	Rover, Robert Q.	Lieut.
Iowa		
Dubuque	Lange, Harold E.	Lieut.
Kentucky		
Bradfordsville	Shreve, William M.	Lieut.

Louisiana

Jeanerette	Walker, Ira G.	Lieut.

Maine

Bath	Snow, Rita M.	Ens.

Maryland

Baltimore	Pfeifer, Wm. E., Jr.	Lieut.

Massachusetts

Beverly Farms	Pope, Horace E.	Lieut.
Boston	Stein, Robert S.	Lieut.
Brookline	Kaplan, Henry	Lieut.
Westboro	Hennessy, Robert N.	Lieut.

Michigan

East Jordan	Pray, David C.	Lieut.
Ishpeming	Jacob, Arthur E.	Lieut.
Jackson	O'Dell, Howard L.	Lieut.
Pigeon	Elbing, Henry F.	Lieut.

Minnesota

Minneapolis	Waters, A. R.	Lt. Cmdr.
Mountain Iron	Hackett, Dale B.	Lieut.

Mississippi

Carthage	Brooks, T. H., Jr.	Lieut.

Missouri

Fulton	Hutson, Wm. E.	Lt. Cmdr.
Kansas City	Bentley, C. A., Jr.	Lieut.

New Hampshire

Rochester	Cullen, Roland P.	Lieut.

New York

Auburn	Knapp, Paul B.	Lieut.
Bronx	Kahn, Seymour L.	Lieut.
Brooklyn	Blank, Herbert H.	Lt. Cmdr.
Brooklyn	Elburn, Maynard	Lieut.
Brooklyn	Goldrich, Nathaniel	Lieut.
Brooklyn	Gottlieb, Richard	Lieut.
Brooklyn	Halbreich, Lester	Lt. Cmdr.
Brooklyn	McGrath, J. G.	Lt. Cmdr.
Brooklyn	Rafkin, Irving D.	Lt. Cmdr.
Brooklyn	Schneider, R. H.	Lieut.
Brooklyn	Wesolowski, V. T.	Lieut.
Brooklyn	Zeff, Seymour	Lieut.
Carthage	Slavin, Sidney	Lieut.
Corona	Tartaro, Anthony C.	Lieut.
Glen Cove	Woycik, Zenan J.	Lieut.
Kingston	Rifenbary, George C.	Lieut.
Lakewood	Wagner, V. R., Jr.	Lieut.
Long Beach	Bendix, William B.	Lieut.
Mt. Vernon	Watsky, Howard F.	Lieut.
New York	Graham, James I.	Lt. Cmdr.
New York	Silling, George	Lieut.
New York	Teitel, Alan L.	Lt. Cmdr.
New York	Weseley, Stanley	Lieut.
Norwich	Wallace, Allan L.	Lt. Cmdr.
Plattsburg	Rowlson, Ira A.	Lieut.
Rockaway Park	Weinstock, Daniel	Lieut.
Tonawanda	Czysz, Henry J.	Lt. Cmdr.
Voorheesville	Spore, Donald T.	Lieut.
Westbury	Ropke, W. A.	Lt. Cmdr.

North Carolina

Boone	Bingham, George D.	Lieut.

North Dakota

Bismarck	Humphreys, R. H.	Lieut.

Ohio

Cleveland	Galvin, Louis	Lieut.
Cleveland	Glenn, T. W.	Lt. Cmdr.

Oklahoma

Tahlequa	Greever, Joe W.	Lieut.

Oregon

Portland	Johnson, D. E.	Lt. Cmdr.
Portland	Rosenthal, L. A.	Lieut.
Vale	Smith, Clifton H.	Lieut.

Pennsylvania

Altoona	Pfeffer, Joseph R.	Lieut.
Chester	Navin, William J.	Lieut.
Christiana	Mast, Richard R.	Lieut.
Drexel Hill	Kennedy, Thomas J.	Cmdr.
Jenkintown	Sturm, Samuel	Cmdr.
Masontown	Peters, Jerome F.	Lieut.
Oakmont	Ride, Frederick G.	Lieut.
Palmerton	Russell, W. P. S.	Lt. Cmdr.
Philadelphia	Casciato, Joseph N.	Lieut.
Philadelphia	Guentter, Robert F.	Lieut.
Philadelphia	Kaczmar, Theodore	Lieut.
Philadelphia	Stanton, Paul F.	Lieut.
Pottsville	Shemella, Theodore	Lieut.
Scranton	Zukoski, Anthony T.	Lieut.

Rhode Island

Central Falls	Dembski, Edmond L.	Lieut.
West Warwick	Maynard, Mozart	Lieut.

Tennessee

Memphis	Ziehm, Harold W.	Lieut.
Milan	Denney, Robert P.	Lieut.
Portland	Searcy, Reuben H., Jr.	Lieut.

Texas

Beeville	Levin, Harry L.	Cmdr.
Dallas	Avann, James A. R.	Lieut.
Dallas	Franklin, Elvin K.	Lieut.
Dallas	Huguley, H. T.	Lt. Cmdr.
Longview	Rushing, Ralph W.	Lieut.

Utah

Ogden	Beltz, William H.	Lt. Cmdr.

Virginia

Norfolk	Hirsch, Arthur S.	Lieut.
Roanoke	John, James E., Jr.	Lieut.

Washington

Port Blakely	Hanson, Donald F.	Cmdr.

West Virginia

Mt. Nebo	King, Samuel L.	Lieut.
S. Charleston	Urling, Walter H.	Lieut.

Wisconsin

Madison	Luster, Eunice A.	Ens.
Milwaukee	Geiser, Adie P.	Lieut.
Winter	Stanhope, Stuart C.	Lieut.

ANNOUNCEMENTS

MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama	April 8-10	Birmingham	G. W. Matthews	1922 Tenth Ave., S., Birmingham 5
Arizona			R. D. McDonald	Rm. 601, Valley Bank Bldg., Tucson
Arkansas	May 19-21	Little Rock	I. M. Sternberg	Merchants Bank Bldg., Ft. Smith
California	April 28-30	San Francisco	L. E. Linehan	450 Sutter, San Francisco
S. California			R. L. Borland	Rm. 615, 1052 W. Sixth St., Los Angeles
Colorado			R. A. Downs	Republic Bldg., Denver
Connecticut			E. S. Arnold	37 Linnard Road, W. Hartford
Delaware			J. Krygier	309 S. State St., Dover
District of Columbia			M. E. Colvin	1726 21st St., N. W., Washington
Florida			A. J. Fillastre	603 Marble Arcade, Lakeland
Georgia			R. H. Murphy	605 Bankers Insurance Bldg., Macon
Hawaii	October	Honolulu	J. H. Dawe	P. O. Box 39, Honolulu 10
Idaho	June 9-11	Sun Valley	H. Miller	Moscow
Illinois	Oct. 9-11	Peoria	P. W. Clopper	623 Jefferson Bldg., Peoria
Indiana	May 19-21	Indianapolis	E. E. Ewbank	Kingman
Iowa	May 6-8	Des Moines	A. N. Humiston	417 Higley Bldg., Cedar Rapids
Kansas	May 12-15	Kansas City, Mo.	F. A. Richmond	1008 Huron Bldg., Kansas City
Kentucky	March 31-April 2	Louisville	J. L. Walker	640 Barbee Way, S., Louisville
Louisiana	April 10-12	New Orleans	J. S. Bernhard	407 Medical Arts Bldg., Shreveport
Maine			A. H. Garcelon	State House, Augusta
Maryland	April 28-30	Baltimore	J. H. Shackelford	706 Baltimore Life Bldg., Baltimore
Massachusetts	May 5-8	Boston	P. E. Adams	106 Marlborough St., Boston
Michigan	April 14-16	Detroit	H. C. Gerber, Jr.	1514 Olds Tower Bldg., Lansing
Minnesota	Feb. 24-26	Minneapolis	L. M. Cruttenden	Lowry Medical Arts Bldg. St. Paul
Mississippi	June 1-4	Biloxi	O. L. Colee	Magnolia
Missouri	May 12-15	Kansas City	C. W. Digges	Exchange National Bank Bldg., Columbia
Montana	May 1-3	Missoula	C. S. Renouard	304 Phoenix Bldg., Butte
Nebraska	May 12-14	Lincoln	F. A. Pierson	Federal Securities Bldg., Lincoln
Nevada			L. G. Jacob	601 Medical Dental Bldg., Reno
New Hampshire	June 15-17	Portsmouth	F. E. Williams	814 Elm St., Manchester
New Jersey	April 27-30	Atlantic City	J. G. Carr	407 Cooper St., Camden
New Mexico	May 26-28	Santa Fe	J. E. Eilar	First National Bank Bldg., Albuquerque
New York	May 13-16	Buffalo	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	May 4-7	Pinehurst	C. W. Sanders	Benson
North Dakota			F. A. Maides	Grand Forks
Ohio			E. C. Mills	220 S. Cassady Ave., Columbus
Oklahoma	April 13-16	Oklahoma City	E. Wise	Medical Arts Bldg., Tulsa
Oregon	June 5-7	Portland	W. H. Hurley	Selling Bldg., Portland
Panama Canal Zone			I. Buchin	Post Dental Surgeon, APO 834, c/o PM, New Orleans
Pennsylvania	May 6-8	Philadelphia	E. R. Aston	421 Market St., Kingston
Philippine Islands			G. A. Carreon	9 Broadway, Third St., N. Manila
Puerto Rico	Jan. 23-36	San Juan	R. Miranda	Box 747, Rio Piedras
Rhode Island	Jan. 20-22	Providence	M. S. Messore	707 Union Trust Bldg., Providence
South Carolina	April 27-29	Myrtle Beach	J. R. Owings	Greenville
South Dakota	May 29-31	Custer	E. W. Elmen	Sioux Falls
Tennessee	May 12-15	Nashville	E. J. Justis	Exchange Bldg., Memphis
Texas	April 28-May 1	San Antonio	W. Ogle	313 Medical Arts Bldg., Dallas
Utah			M. G. Kuhre	Tribune-Telegram Bldg., Salt Lake City
Vermont	May 25-27	Woodstock	J. A. Larrow	Middlebury
Virginia	April 14-16	Roanoke	J. E. John	804 Medical Arts Bldg., Roanoke
Washington	May 5-7	Spokane	F. J. Dingler	1502 Medical & Dental Bldg., Seattle 1
West Virginia	May 19-21	Bluefield	C. J. Gavelda	Clarksburg
Wisconsin	March 31-April 2	Milwaukee	K. F. Crane	1233 Bankers Bldg., Milwaukee 2
Wyoming			J. D. McNiff	Laramie

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Alabama	Jan. 27-30	Birmingham	M. W. Gaillard	1508 Merchants Bank Bldg., Mobile
California	Feb. 10-14	San Francisco	K. I. Nesbitt	515 Van Ness Ave., San Francisco 2
Iowa	March 17-22	Iowa City	H. G. Bolks	923 Badgerow Bldg., Sioux City
Massachusetts	Feb. 10-12	Boston	J. C. Wilson	413N State House, Boston 33
Michigan	Feb. 3	Ann Arbor	H. T. Wood	502 David Whitney Bldg. Detroit 26
Mississippi	June 3-5		W. R. Madden	Forest
Nebraska	Feb. 4-7	Lincoln	C. A. Bumstead	924 Stuart Bldg., Lincoln
Pennsylvania	Feb. 17-22*	Philadelphia	R. E. V. Miller	61 N. Third St., Easton
Ohio	March 10-13	Columbus	E. D. Lowry	79 E. State St., Columbus
Oregon	March 3-6	Portland	F. L. Utter	506 Pioneer Trust Bldg., Salem
South Carolina	July 7	Columbia	E. G. Bumgardner	1517 Hampton St., Columbia 29
Tennessee	Jan. 20-24	Memphis	J. J. Vaughan	1005 Medical Arts Bldg., Nashville 3
Wisconsin	Feb. 10-14	Milwaukee	S. F. Donovan	Tomah

*Feb. 17-19, written (dental); Feb. 18-19, written (hygienists). Feb. 20-22, clinical (dental); Feb. 20, clinical (hygienists).

OTHER MEETINGS

Name	Date	City	Secy. or Chm.	Address
American Association of Orthodontists, Central Section	April 14-15	Minneapolis	C. R. Baker Chm.	636 Church St., Evanston, Ill.
American Association of Public Health Dentists	Feb. 9	Chicago	C. L. Sebelius Secy.	Tennessee Department of Public Health, Nashville
American Dental Association	Aug. 4-8	Boston	H. Hillenbrand Secy.	222 E. Superior St., Chicago 11
American Society for the Advancement of General Anesthesia in Dentistry	March 24	New York	M. H. Feldman Ex. Secy.	730 Fifth Ave., New York
District of Columbia Postgraduate Clinic	March 10-13	Washington	V. V. Skinner Publicity Chm.	1418 Good Hope Road, S. E., Washington 20.
Thomas P. Hinman Mid-Winter Clinic	March 23-25	Atlanta	S. A. Garrett	Medical Arts Bldg., Atlanta
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Washington University, Dental Alumni, Eighty-First Annual Meeting	Feb. 21-22	St. Louis	V. P. Thompson Secy.	111 W. Lockwood Ave., Webster Groves, Mo.
Northeastern Society of Orthodontists	March 10-11	New York	O. Jacobson Secy.	35 W. 81st St., New York
Greater Philadelphia Annual Meeting, Philadelphia County Dental Society	Feb. 5-7	Philadelphia	E. H. Smith Chm.	Stock Exchange Bldg., Philadelphia
Southwestern Society of Orthodontists, Twenty-Sixth Annual Meeting	Feb. 2-5	Dallas	J. O. Bailey Secy.	Hamilton Bldg., Wichita Falls

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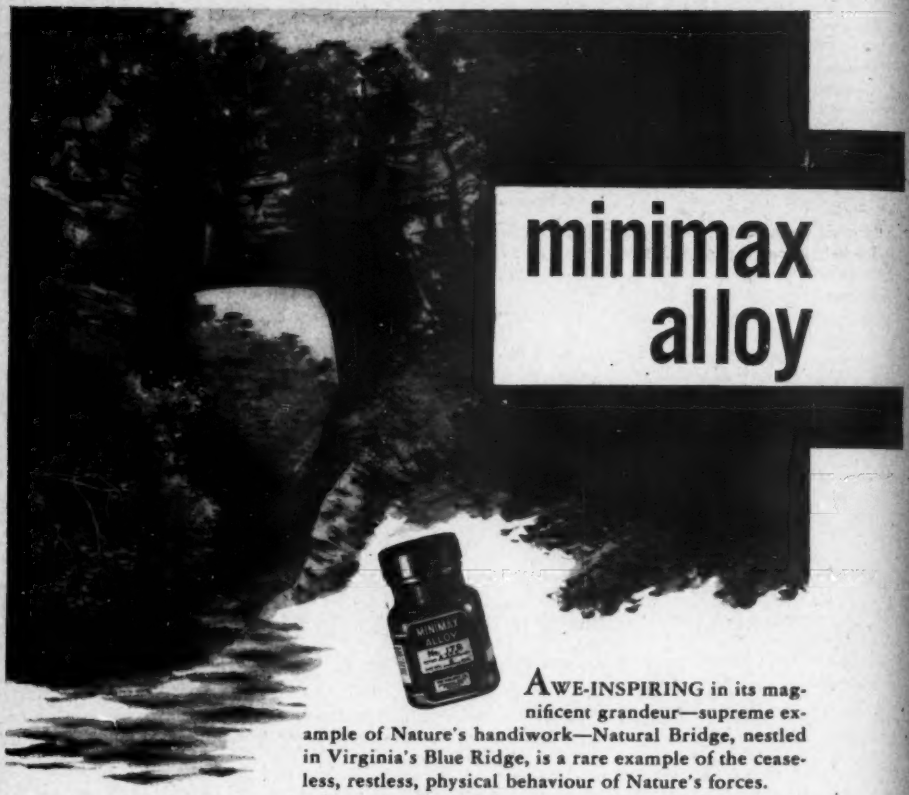

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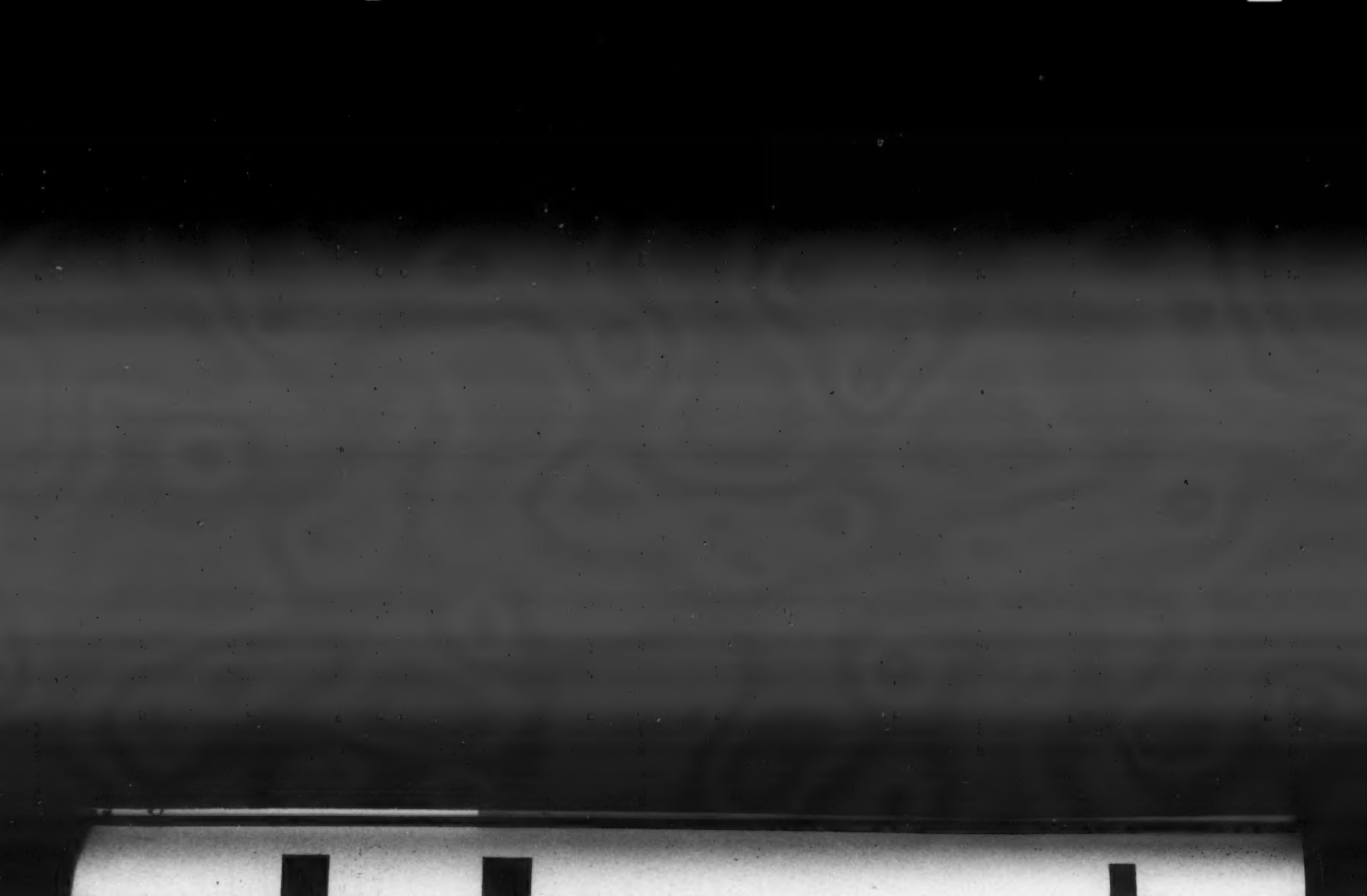
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